ACTIVE Workbook

European Construction Institute

ACTIVE
ENGINEERING CONSTRUCTION INITIATIVE

Achieving Competitiveness Through Innovation and Value Enhancement

ACTIVE WORKBOOK

October 1998

Prepared for ACTIVE by Knott Associates

ACTIVE WORKBOOK

CONTENTS

ACTIVE WORKBOOK

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CONTENTS

LIST OF ATTACHMENTS

Attachments are included at the end of each Value Enhancing Practice as follows:

VEP 1.3	Attachment 1.3-A	Check List for Planning
VEP 1.4	Attachment 1.4-A	Life Cycle Costing
VEP 1.5	Attachment 1.5-A	Techniques Relating to SHE Issues
VEP 1.6	Attachment 1.6-A	Preparation of Project Information Strategies
VEP 2.1	Attachment 2.1-A	Selection of Project Organisation: Questionnaire
VEP 5.1	Attachment 5.1-A	Check List for Sources of Project Risk
VEP 5.2	Attachment 5.2-A	Examples of Key Success Criteria
	Attachment 5.2-B	Sample Framework Agreement
	Attachment 5.2-C	Post Project Check List
VEP 6.1	Attachment 6.1-A	Methods for Assisting Continuous Improvement
VEP 7.1	Attachment 7.1-A	Check List for Project Control
VEP 7.2	Attachment 7.2-A	Technical Audit Check List Process Engineering
	Attachment 7.2-B	Technical Audit Check List Mechanical Engineering
	Attachment 7.2-C	Technical Audit Check List Electrical Engineering
	Attachment 7.2-D	Technical Audit Check List Instrument Engineering
	Attachment 7.2-E	Technical Audit Check List Civil Engineering
	Attachment 7.2-F	Technical Audit Check List Architectural Engineering
VEP 7.3	Attachment 7.3-A	Check List for Project Execution
VEP 8.1	Attachment 8.1-A	Typical Benchmarking Criteria

ACTIVE WORKBOOK

FOREWORD

ACTIVE WORKBOOK

FOREWORD

The first issue of this Workbook was issued as a pilot to ACTIVE Stakeholders in January 1998 for comment. This second issue has incorporated the many comments and suggestions arising from that issue.

The feedback on the Pilot Workbook was very positive with general support for the content of the seventeen ACTIVE Best Practices, representing outcome of the work of the ACTIVE Work Groups. Most of the comments related to the format, structure and ease of use of the document, hence for this second issue, the format has been completely revised and the ACTIVE Best Practices (now renamed Value Enhancing Practices) have been regrouped under a set of eight ACTIVE Principles. These Principles have been developed to ensure that the message of ACTIVE is clear and to provide succinct guidance to project teams on the key areas where benefit and performance improvement can be achieved.

The supporting Value Enhancing Practices provide more detailed guidance to project practitioners in specific improvement areas, and have increased in number from seventeen to twenty three as new ones have been added to cover omissions and the contents of others divided to enable a better grouping under the eight ACTIVE Principles.

Other parts of the Workbook have also been revised. The Introduction has been updated to reflect the progress made within the ACTIVE Initiative and the Best Practice Effectiveness Section has been expanded into an Implementation Section, giving advice on effective use of the Workbook on projects. Of particular note is the set of Assessment Check Lists in Section 4 which can be used for reviews during the project to check the extent to which the ACTIVE principles and practices are being applied. Finally the References Section has been expanded to cover the new Inter-ACTIVE network which has been formed to provide a network of support and expertise across the industry in the application of the ACTIVE Principles and practices.

The aims of ACTIVE remain as challenging as ever: to reduce costs significantly and to add value through the capital construction process with the aim of improving the overall competitiveness of the industry. It must be emphasised that intellectual assent to the principles and practices described in this Workbook is not enough. To meet the challenge it is essential that the whole culture, behaviour and attitude of all involved must change, and the traditional adversarial and inefficient working practices of the past must be replaced by an alignment of interests towards common business goals across the whole value chain. Only by striving for this new order can we create a world class UK industry with satisfied clients and thriving contractors and suppliers.

This ACTIVE Workbook is meant to be used exactly as its name suggests. Please use it on your projects, distribute it to project managers, teams and individuals and encourage them to apply the principles and practices. As before, it continues to be important that comments, views and experiences are fed back to the Inter-ACTIVE network via the ACTIVE Secretariat to ensure that the Workbook represents best practice for our industry.

I hope you find the ACTIVE Workbook both useful and stimulating, and wish your business increased success through its application.

Terry Lazenby
Chairman, ACTIVE Initiative October 1998

Achieving Competitiveness Through Innovation and Value Enhancement

SECTION 1

INTRODUCTION

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SECTION 1

INTRODUCTION

1.1 Why ACTIVE?

ACTIVE - 'Achieving Competitiveness Through Innovation and Value Enhancement' - is a focused initiative to demonstrate that the cost of executing projects for the onshore process and energy industries can be reduced by 30% by applying improved techniques and eliminating activities which do not add value.

International companies in the oil and gas, process and energy sectors are increasingly demanding in their requirements for the execution of major projects. In turn, global competition for their products is determining the need for cost effective, reliable plants to be constructed to ever tighter schedules. Added to this, environmental regulation and rigorous safety requirements are demanding a more sophisticated response from a process engineering and construction industry which itself is facing growing competition.

If companies which have a choice are to locate their projects in the UK and select UK contractors and equipment for overseas projects, the UK industry needs to respond and compete more effectively by cutting its costs, raising quality and reliability, and generally improving its performance. The rewards are considerable. A more competitive industry will win more projects both at home and overseas, and a cheaper, more reliable product will encourage greater investment and a growing market for contractors and suppliers, with greater employment opportunities for their workforce. It is this challenge that led to the launch of the ACTIVE Initiative in 1996.

ACTIVE has defined a vision for the industry as follows:

A world class UK process engineering and construction industry, with satisfied clients and thriving contractors and suppliers.

This will be achieved by the ACTIVE mission which is:

To improve the competitiveness of the UK process engineering and construction industries by transforming the way in which they execute projects for the process and energy sectors world-wide.

1.2 Who is ACTIVE?

ACTIVE is owned and financed by its Stakeholders, currently comprising some fifty of the largest and most prestigious operators, contractors and supplier organisations in the country (see Section 5). ACTIVE is also backed by the Department of Trade and Industry, which, in addition to its overall concern for UK industry's competitiveness, is particularly keen to ensure that the views of the entire supply chain - including the many companies which are categorised as Small and Medium Sized Enterprises (SMEs) - are fully taken into account in the ACTIVE initiative.

1.3 ACTIVE - The First Phase

ACTIVE has set out to achieve its objectives in three years. The nominal start date was 1st January 1997, but even before that an Action Plan had been drawn up. Among the many points made in the Plan the following were significant:

- Inefficient business processes which have produced a culture of confrontation rather than co-operation must be eliminated

- Cultural change will be necessary at all levels, both throughout the entire supply chain and vertically throughout each of the organisations involved in the industry

- Within the project environment the greatest opportunities for effecting value improvement are to be found in the earliest stages of projects

From this analysis Workgroups were established to make recommendations for improved practices in five generic areas:

- People and Behaviour
- Procurement
- Effective Project Execution
- Information Management
- Measurement

An Engineers, Suppliers and Contractors Group (ESCG) was established to provide a communication channel between ACTIVE and the further reaches of the supply chain, and also to ensure direct SME input into the Workgroups.

The Workgroups consisted of over 100 experienced personnel from Stakeholder companies and were charged with identifying Value Enhancing Practices (VEPs) within the generic areas allotted to them. Seventeen VEPs (originally called ‘Best Practices’) were produced and issued in the ACTIVE Pilot Workbook which was presented to Stakeholders in January 1998.

Stakeholders were asked to consult within their companies and their project teams about the potency of the VEPs in achieving substantially improved project performance. The preliminary feedback was encouraging and a survey of Stakeholders suggested that systematic and rigorous applications of the VEPs can reduce project capital cost by over 23% - a significant contribution toward ACTIVE’s 30% target.

Feedback from the Stakeholders also suggested that while the content of the Pilot Workbook was sound it needed to be more user friendly. As a result, in this second edition, the VEPs have been reformatted and grouped under eight ACTIVE Principles. The ACTIVE Principles underpin the VEPs and taken together will ensure that the objectives of improving cost performance and competitiveness on projects is met. The eight principles are defined in Section 2 and the detailed VEPs are included in Section 3.

This Workbook and the principles that it contains constitute the primary tools for ACTIVE to achieve its objectives. It is intended to be a living, dynamic document, subject to continuous improvement throughout the life of the Initiative. The issue of this revised edition effectively ends the first phase of ACTIVE.

1.4 ACTIVE - The Next Phase

The focus of the next phase is to ‘deliver’ the ACTIVE principles and practices to the industry and to demonstrate their effectiveness. Hence the new focus is upon:

- Communication
- Education
- Implementation

Each of these activities is overseen by a Steering Group with members drawn from across the industry. The existing Workgroups set up under the first phase of ACTIVE have been merged into Inter-ACTIVE (see Section 1.4.4), the ACTIVE network of knowledge and experience which supports the activities of the new Steering Groups as well as providing support for the application of the ACTIVE Workbook and other guidelines during implementation.

1.4.1 Communication

Crucial to ACTIVE's success is an effective communications strategy which enables the initiative to deliver its principles and messages at all levels, throughout operator, contractor and supplier organisations and across the breadth of the industry.

The Communications Steering Group is charged with directing activities to fulfil the objectives of the communications strategy. Key to communication success is the promotion of ACTIVE's work and benefits to a very wide ranging audience. The message must be targeted to the different sectors in this audience in a cost effective manner.

The communications plan includes awareness campaigns through advertising, press coverage, presentations, conferences, roadshows and reporting of pilot project success stories. To enable dissemination of information on a global basis, ACTIVE has designed an ACTIVE Internet web-site to encourage two-way communication and feedback on the effectiveness of all ACTIVE operations. A variety of tools have been produced to aid the communications, implementation and education processes, including brochures, videos, presentation aids and newsletters.

1.4.2 Education

Those more directly involved in project execution need a deeper understanding of the ACTIVE Principles and how to apply them. In addition, the next generation of project practitioners need to be exposed to the Principles at an early stage of their careers. The role of the Education Steering Group is to develop and implement an education and training strategy for ACTIVE. This will entail working closely with the other Steering Groups to determine education and training requirements, followed by developing appropriate means of delivery, for example by working with academia or other training organisations.

1.4.3 Implementation

The implementation and monitoring of the ACTIVE Principles and VEPs on Pilot Projects is a necessary step, both for testing their effectiveness and for demonstrating that they will actually deliver the benefits claimed for them. A number of such projects have been proposed by Stakeholders. The ACTIVE Implementation Steering Group, which consists of representatives from across the supply chain, will oversee a monitored implementation process.

Measurement is fundamental to the demonstration of the effectiveness of the ACTIVE principles. ACTIVE is adopting two well established benchmarking systems for measuring the effectiveness of the ACTIVE Principles on pilot projects and more generally in the industry.

1.4.4 Inter-ACTIVE - the Value Enhancement Network

In addition to the monitored implementation programme on identified Pilot Projects, ACTIVE is encouraging the widespread adoption of the VEPs across the industry. To assist in providing a 'Helpline' for this process ACTIVE has created Inter-ACTIVE, a network consisting of the members of the former Workgroups together with members of the ESCG. The Inter-ACTIVE network has several roles:

- To ensure that the ACTIVE Workbook is developed, maintained and updated to capture best practice in the industry
- To provide an experienced and knowledgeable network of professionals across the industry which can support the ACTIVE implementation process by advice on how ACTIVE best practices might be applied
- To help generate appropriate material on best practices for training packages or wider communication messages within the industry

Further details about Inter-ACTIVE are given in Section 5.

1.5 After ACTIVE

The current ACTIVE initiative completes its plan at the end of 1999. By that time ACTIVE will have demonstrated the effectiveness of the ACTIVE Principles on pilot projects. However, the work of ACTIVE and the commitment that it has generated must not be allowed to dissipate. This requires the industry to decide how the impetus can be maintained, either by a continuation of ACTIVE or its succession by a new or existing organisation.

1.6 The ACTIVE Workbook

The purpose of this Workbook is to explain and expand the ACTIVE Principles and Value Enhancing Practices which have been produced by the Workgroups. The intention is that the Workbook be used on real engineering capital projects, both the pilot projects which ACTIVE will use to test their effectiveness, and more generally in projects across the industry. It is essentially a working document for those who have the responsibility for delivering capital projects. As such, it is a living document which will incorporate feedback and improvements as projects implement the principles and practices.

The task of the Workgroups has been to identify current existing best practice in the specific areas of improvement that ACTIVE has identified, and to articulate how this practice can be applied more widely to improve project performance. There has been no intention to needlessly 'reinvent the wheel' nor to attempt to cover all aspects of industry activity. References and further reading are therefore included where additional help or information on these wider topics can be found.

The eight ACTIVE Principles set out in Section 2 provide a concise statement of that which has to be achieved to improve performance and effectiveness in each area. More detailed advice is covered in the supporting Value Enhancing Practices (VEPs) in Section 3 together with Attachments where relevant. Each VEP is structured with a brief description of Purpose and Benefit which could result from its practical application. Essential Activities - the vital actions required to put the VEP to work - are stated, followed by Guidelines for Implementation to assist with their application. Where appropriate, Attachments are added to support particular aspects of a VEP.

Contact information for the ACTIVE Secretariat, the Inter-ACTIVE network including the Workgroups, and other organisations, is included in Section 5.

1.7 Measuring the Effectiveness of ACTIVE

There are no insurmountable barriers to the success of the ACTIVE mission. Changes of the magnitude required have been achieved in the onshore engineering construction sector previously and offshore through the CRINE initiative (Cost Reduction Initiative for the New Era). There are however very real barriers to success and it is only by understanding them that their avoidance or resolution can be effected.

The dramatic changes required by ACTIVE are both extensive and deep. Changes in attitude and behaviour are necessary, both within organisations and at the contractual interface with others, in order to remove adversarial practices and replace them with a willingness to work as a team behind aligned objectives.

The ACTIVE Workbook is intended to function as a practical tool for industry projects to help realise these changes. To be effective, it must be distributed throughout organisations and projects to maximise awareness and understanding of the ACTIVE Principles and practices and should be used by project managers, key team members and all those who can influence the outcome of a project. Most importantly, it must be endorsed and promoted by senior business members within supply chain companies as well as business decision makers in the operating companies.

Feedback on the use of this Workbook, both good and bad, is important so that continuing improvements can be made. Provision is made within the Workbook in Section 4 for review and assessment, including a set of Assessment Check Lists and a Project Cost Savings proforma, intended to encourage feedback on the extent to which these principles and practices have been applied, and to report the degree of benefit resulting from the ACTIVE approach. Such feedback will be most useful in validating ACTIVE Principles and practices. In the first instance, feedback should be directed to the ACTIVE Secretariat.

1.8 ACTIVE Workbook Disclaimer and Caution

This workbook is a compilation of good practice guidelines drawn up by experienced practitioners on the basis of information currently available for use in the process, energy and utilities industries for capital construction projects. While all reasonable efforts have been made to ensure that the guidelines and principles set out in this workbook, when properly applied, will improve capital effectiveness, neither ACTIVE, its members, employees, agents, working groups, working group members nor any contributor to this workbook can accept any liability for the application of these principles and guidelines and the consequences resulting from this in relation to any specific project. Each organisation engaged in a project using the principles and guidelines set out in this workbook must accept responsibility for their application to that particular project and the consequences of this and should, if there are particular areas of concern, seek professional advice as to implications of their use in the circumstances of that project.

SECTION 2

THE ACTIVE PRINCIPLES

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THE ACTIVE PRINCIPLES

The ACTIVE initiative is underpinned by a set of eight ACTIVE Principles which provides the foundation for an industry culture characterised by co-operation, trust and commercial efficiency. The adoption of these principles and their integration into the day-to-day working of the industry are essential steps to achieve the ACTIVE vision.

The eight ACTIVE Principles are:

AP1. Effective Project Concept and Definition

AP2. Effective Project Team Management

AP3. Effective Supply Chain Relationships

AP4. Effective Information Management and Communication

AP5. Effective Project Risk Management

AP6. Effective Innovation and Continuous Improvement

AP7. Effective Project Execution

AP8. Effective Performance Measurement

In the following sections, each of these principles is explained in detail, identifying the supporting ACTIVE Value Enhancing Practices (VEPs) in each case.

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ACTIVE Principle 1: Effective Project Concept and Definition

The construction of an engineering project is part of a business investment process which should be the responsibility of an appointed project owner or sponsor. For the definition and execution of the capital project the project owner should ensure that a managed project process is in place with appropriate stage gates to control the process, and a project manager appointed.

At the outset of the project, the project manager should ensure that a process of concept development and definition is thoroughly completed. This must identify the commercial and technical objectives for the project, tested against the business drivers, and clearly present the success criteria against which the project will be judged.

In this process, key questions to be addressed are:

- Why is this project being considered?
- What are the scope and boundaries of the project?
- How will the project be executed?

An essential requirement is that all key project team members, whether from within the project owning organisation or external in the supply chain, should be involved at an appropriate stage in this process. This is necessary to ensure a common understanding of project goals, reinforced by an alignment and commitment to those goals by all those involved in the project, or with a stake in the outcome.

While this process will probably entail a series of iterations and evaluation of options as proposals are tested against business objectives, it is important that the outcome should include a clear, unambiguous statement, agreed by all parties, of project objectives, scope and implementation strategy before the actual implementation proceeds.

In the front end definition process, the scope of the project must be established in sufficient detail to assure the sanctioning authority that the investment objectives can be delivered and that the proposal represents value for money at an acceptable level of risk. At this stage it is important to employ practices to enhance the value of the project by challenging assumptions, considering alternative innovative solutions and rigorously testing the technical basis of proposals. Techniques such as risk assessment and value analysis are critical at this stage.

It is important that the outcome of this definition process provides a clear and unambiguous brief of requirements to those who have to execute the project, who themselves should be fully involved in the definition process. The scope documents should not only state what is included in the project, but also that which is excluded from the scope.

The implementation strategy should address all the key aspects of the project implementation process and should, as a minimum include strategies for:

- Project management and control
- Project organisation and resourcing
- Communications
- Information management
- Safety, health and environmental policy
- Procurement
- Co-ordination procedures
- Innovation and application of technology
- Management of key external interfaces

In developing these strategies, it is essential to involve the project execution team fully, since these strategies will form the basis of all subsequent activities to achieve the completion of the project. Together with the project scope, they form the basis for the project work breakdown structure, schedules, resource plans and cost estimates on which the project will be authorised.

Supporting Value Enhancing Practices:

VEP 1.1	Project Process
VEP 1.2	Project Definition and Objectives
VEP 1.3	Project Planning
VEP 1.4	Value Analysis
VEP 1.5	Safety, Health and Environment
VEP 1.6	Information Management Strategy
VEP 1.7	Procurement Strategy

ACTIVE Principle 2: Effective Project Team Management

The effectiveness of a capital project will be determined largely by the people involved and how closely they are working to common, aligned objectives. This includes personnel from contractors, consultants or suppliers working on the project as well as in-house staff. Key elements necessary to achieve team effectiveness include:

- Clear leadership of a focused integrated team
- Effective selection processes for recruitment of staff and placing of contracts
- Team capability through inclusion of the necessary skills and competencies
- Clarity of roles and responsibilities within the team
- Effective and timely communications throughout the team
- Common understanding of project aims and how each individual effort contributes to those aims
- A ‘no blame’ culture with a readiness to learn from both success and failure
- Motivation to achieve the result and recognition of individual contributions
- Contractual arrangements which foster team integration

It is the responsibility of the project manager to direct and manage the project to achieve these necessary elements. The key is to establish a results orientated team culture from the outset, harnessing the skills of all team players to achieve commitment and ownership. Team building and regular involvement of the team in decision making and review are important means to achieve this. The contractual arrangements must also facilitate an integrated team approach and alliance or partner-type contracts are commonly effective in achieving this result.

To ensure that all team members are working effectively, it is essential that everyone shares a common understanding of the desired results, both final and interim, and a clear understanding of personal roles in achieving these. While critical success factors should be clear and demanding, targets should be realistic with agreed milestones.

To ensure effective motivation of all the team, incentives, including both personal and corporate reward incentives, should be considered. Disincentives should be used with care since motivation by fear can destroy trust and work against achievement of project objectives.

The competence ‘mix’ of the project team needs careful assessment. Shortcomings in capability should be redressed by appropriate training and education programmes which should be built into the project schedule.

Supporting Value Enhancing Practices:

VEP 2.1 Project Team Organisation

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ACTIVE Principle 3: Effective Supply Chain Relationships

Project relationships should be focused on encouraging the whole supply chain to act in unison to achieve clearly stated project goals. Overall supplier contribution in terms of broader project benefits must be recognised, rather than judgement being based solely on price. Within the context of the project objectives, innovation should be fostered and an equitable sharing of risk and reward should be incorporated into the commercial relationship.

Within the process industry it has only recently been recognised that to achieve business competitiveness, project performance is as important as superior product and process technology. For projects to be successful the entire supply chain must be aligned to project objectives, while proper apportionment of risk and reward should provide the opportunity for all participants in the supply chain to benefit.

All members of the supply chain, whether owner/operators, contractors or suppliers, should work together to maximise value, rather than seeking to move cost or risk up or down the supply chain. In this way competitiveness for both buyers and sellers can be improved.

Supply chain relationships develop over the life cycle of the project. The framework established at the outset of the project which defines the relationship should provide the basis for prompt resolution of problems as they emerge and provide an effective and timely way of meeting mutually beneficial objectives.

The application of this ACTIVE Principle will benefit all parties through a more equitable apportionment of risk and reward, greater clarity of project objectives, active participation in the creation of value throughout the supply chain and elimination of unnecessary cost. Where appropriate, these objectives may be achieved through an alliance partnership or risk and benefit framework agreement in which the parties formally take a stake in the project outcome, sharing risks and benefits in line with their stake.

Key elements for supply chain improvement are:

- Establishing clear targets and objectives
- Alignment of objectives between buyer and seller
- Effective and open communications between all parties
- Establishing a relationship appropriate to the business being conducted
- Encouraging innovation within the constraints of the project objectives

With these elements in place, the effectiveness of the supply chain will contribute to the long term performance of the industry. Confidence between buyers and the sellers will, over a period of time, develop into trust, thereby creating effective and long lasting relationships which benefit all parties.

The changing demands of buyers can be accommodated by an efficient and responsive supply chain provided there is proper recognition of the effort and resources needed to deal with the challenge.

Only by striving to create a value based supply chain with a vision to create a globally successful industry which encourages reinvestment, will the long term future for the industry be assured.

Supporting Value Enhancing Practices:

VEP 3.1	Procurement Cycle Management
VEP 3.2	Supplier Selection
VEP 3.3	Contract Dispute Resolution

ACTIVE Principle 4: Effective Information Management and Communication

Capital projects require the generation and handling of large amounts of information, much of which is required subsequently in the operation and maintenance of the facility. The effective management of information during the life cycle of a project will do much to improve communications and increase project performance in terms of both time and cost.

During project execution, unnecessary duplication and regeneration of information should be avoided which not only saves time and resources but reduces opportunities for errors. Information must be provided in a timely way to project participants, relevant senior managers and others who need to know, thereby improving communications within the supply chain. The requirements for project handover to operations and maintenance at the time of project completion should be established at the outset of the project, covering information content, format and timing. The compilation of this information must be managed throughout the execution of the project to ensure handover with the minimum of effort and delay.

Key activities to achieve effective management of information include:

- Early mobilisation of appropriate personnel from client and contractor to agree the information requirements of the project
- Preparing a project information management strategy at an early stage of the project
- Communicating that strategy to everyone involved
- Using the most appropriate information technologies to generate, transmit, index, store and communicate documents and data
- Agreement throughout the supply chain on essential information and documentation requirements, identifying responsible parties and timing requirements.
- Avoiding unnecessary documentation and needless circulation
- Presenting information in a concise and clear way to users at each project stage
- Collating information which can be handed over and transferred into operations and maintenance systems with maximum efficiency

Supporting Value Enhancing Practices:

VEP 4.1 Information Management

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ACTIVE Principle 5: Effective Project Risk Management

The process of project risk management is a structured way of managing exposure to risk throughout the life of the project and beyond. These risks are not only technical risks but also include commercial and human risks. Uncertainty at the outset of any investment is usually high and hence the adoption of a managed process to identify, understand and analyse the likely risks before they occur will allow for their subsequent mitigation and management throughout the implementation of the project.

Risk assessment considers both the likelihood of events occurring and the possible consequences. If the identified risks are unacceptable, ways of mitigating or reducing those risks can be sought and contingency plans made. In some cases, risks can be eliminated completely while other risks are completely external to the project, presenting little scope for reduction. Since the risk profile will change with time as the project develops, reassessment of risk should continue throughout the life of the project as part of the risk management process.

Within contractual relationships on the project the aim should be for specific risks to be managed by the party best equipped to deal with that risk at least cost. The potential benefits available to each of the parties in a contractual relationship should reflect the degree of risk borne by each party. Proper management of risk in supply chain relationships should encourage and reward effective innovation and performance.

Key elements of a project risk management process should include:

- Establishing at the outset of the project an efficient risk management programme to monitor and manage risks throughout the life of the project

- Ensuring personnel are trained to identify key risk areas as the project proceeds

- Identifying all known risks at an early stage of the project and establishing a risk register describing the nature of the risk, probability of occurrence and impact should it occur, along with methods for its elimination, mitigation or management.

- Having in place a process for monitoring, updating and reviewing the risk register throughout the life of the project

- Within supply chain relationships, identifying and agreeing the risks to be borne by each party balanced against the potential benefits. The risk/benefit balance should be reflected formally in the contracts between the parties

Supporting Value Enhancing Practices:

VEP 5.1 Project Risk Management
VEP 5.2 Risk and Benefit Framework Agreements

ACTIVE Principle 6: Effective Innovation and Continuous Improvement

In order to survive in a competitive environment, it is essential that companies innovate. Innovation should not be confined to product technology but should be apparent throughout the business process including the capital project process. While this is desirable it is not easy to achieve since many current practices in the industry discourage innovation. However, for the industry to move forward to greater competitiveness, traditional practices must be challenged and, if found lacking, replaced by more effective solutions.

From the start of a project, teams should consider innovative alternatives to achieve the business and project objectives which challenge existing assumptions. Significant benefit can be achieved by channelling innovation towards improving operational systems, technology and plant performance. The application of innovative solutions to both project engineering and project management can significantly enhance the performance of a capital investment.

This culture of innovation and continuous improvement should also extend throughout the supply chain. Innovation should be encouraged at all stages of the project process from feasibility to completion. New ideas which facilitate the achievement of project objectives should be properly rewarded while confidentiality and intellectual property rights are upheld. This entails changing many traditional contractual arrangements which often discourage or do not properly reward innovation.

The benefits of technical innovation are greater at the conceptual stage of a project before implementation commences. Much can be gained by developing cost effective options during the project definition phase, particularly through the involvement of contractors or suppliers with special expertise, or when a novel design is being proposed. Use of novel or complex technology, such as complex control systems, can sometimes be difficult to manage with increased uncertainty of project outcomes. It is important, therefore, that the application of new technology is properly assessed beforehand in terms of risk, and that development programmes are not allowed to create disruptive changes during project execution.

Innovation and continuous improvement also have a significant part to play during the project execution phase where imaginative solutions can often yield benefits in terms of time, cost or technical effectiveness. Aspects of project implementation such as contracts, site working practices, safety, design methods, project organisation, troubleshooting and communications are areas where there is often scope for innovative ideas to improve methods of achieving the project goals.

All phases of the project life cycle will benefit from exploiting the integrated experience and capability of the project team, while ensuring that efforts are focused on improving, in practical achievable increments, the methods and procedures adopted.

Lessons learned as the execution of the project proceeds should be captured through a process which encourages those involved to feed experiences forward for the benefit of future projects. This process should be ongoing beyond the end of the project to ensure operational experience is also captured. Lessons learned at the early developmental stages of projects are often of most value since it is at this stage that the biggest opportunity for value enhancement exists. It is often beneficial to hold periodic ‘peer reviews’ with other projects, including projects from other companies, to share learning and experience.

Key activities in developing continuous improvement on projects are:

- Defining and targeting specific areas where improvement can be achieved
- Setting specific improvement objectives and, where possible, benchmarking the outcome
- Establishing a ‘challenge’ culture on projects where the project team can challenge and test assumptions within the constraints of the project objectives
- Establishing an effective process for capturing learning and ensuring it is applied on future projects
- Reviewing options and selecting methods by which improvements can be achieved, establishing the most practical means to implement these
- Continually monitoring performance against agreed objectives and targets
- Reviewing progress and ensuring that all positive feedback is channelled towards further performance improvement
- Holding periodic ‘peer reviews’ with other projects to share learning
- Reviewing operational experience on the plant one year after start up

Supporting Value Enhancing Practices:

VEP 6.1 Continuous Improvement
VEP 6.2 Innovation and Intellectual Property

ACTIVE Principle 7: Effective Project Execution

The effectiveness of the execution stage of a project will depend greatly upon the quality and thoroughness of the project definition and the extent to which the project objectives, scope, strategy and execution plan have been defined. The way in which a project is subsequently managed through the execution stages can be crucial to delivering an effective project but this depends upon an effective project process being in place.

The key methods for improving project execution include:

- Effective control of schedule, costs and changes to scope, plus the timely provision of competent resources needed to deliver the project

- An efficient detailed design and specification process which ensures the project will meet its objectives and deliver a plant which can be built and operated in a cost effective manner

- Ensuring that supply chain relationships work effectively and that contractors, subcontractors and suppliers operate as part of the team with true alignment to project goals

- Early evaluation of key construction issues, especially interfaces with existing plant operating areas. Most importantly this should include issues of site safety

- Ensuring hand over processes operate seamlessly at the various interfaces, for example from design team to procurement and construction; from construction to start up team; and from start up team to final operators. It is particularly important at handovers to ensure that costly and time consuming duplication of checking, testing and inspection is eliminated

- Efficient site organisation and effective materials management

- A strong, consistent and effective safety, health and environmental policy applied throughout the project

- The implementation of an effective communications strategy within the team as well as across other key project interfaces

- Maintaining sound processes for monitoring, reporting and reviewing progress

Supporting Value Enhancing Practices:

VEP 7.1	Project Control
VEP 7.2	Design Effectiveness
VEP 7.3	Constructability
VEP 7.4	Standards and Specifications
VEP 7.5	Project Handover and Commissioning

ACTIVE Principle 8: Effective Performance Measurement

Measurement is crucial for improving project performance and it is important that measures are established for the various stages of the project process. The starting point for measurement must be the objectives and critical success factors for the project. From this starting point, measures should be defined which will relate activity and progress to the achievement of these goals. Bearing in mind that ‘what you measure is what you will get’, measures must be defined with care, as the choice of inappropriate or sub-optimal measures may drive the project in the wrong direction.

Definition of measures is often not a simple task. ‘Hard’ measures, which can be determined by collecting statistical data and using objective measurement are usually the easiest to obtain but are often less useful indicators of performance than ‘soft’ measures which measure more subjective aspects such as behaviours, relationships and capability. The skill is to find hard measures which are good indicators of the softer issues which drive project performance.

For capital projects, there are two types of measures which need to be defined: output measures which measure whether project objectives have been achieved, and indicator measures which measure factors which will strongly influence whether the required outputs are likely to be achieved.

Typical examples of output measures include:

- Achieved cost
- Safety performance
- Completion date
- Product quality
- Plant flowrate

Typical examples of indicator measures include:

- Quality of definition
- Project organisation and project process
- Supply chain effectiveness
- Design productivity
- Use of value enhancing practices
- Control of changes
- Progress against schedule

Although output measures are the ultimate yardstick of project performance, they are often not available until late in the project when remedial action may be too late.

Indicator measures, however, can be used as the project progresses as predictors of likely outcomes at each of the stage gates in the project process. Indicator measures, therefore, represent a powerful project management tool which can be used for controlling the project and for assuring the project owner on the likely achievement of the project goals.

The use of effective measures on projects and the collection of common, consistent data open the way for benchmarking performance. Benchmarking is a comparative process which uses previously achieved measures of outstanding performance to set challenging standards for improvement on subsequent projects.

The process is based upon measuring current project performance and comparing results with known benchmarks or standards which represent the best in that particular field. It is well established as a powerful technique for driving improvement, based upon measured results rather than intuition or perception.

Since performance benchmarking is concerned with competitiveness, it is usual within the industry for benchmarking to be carried out by a neutral third party organisation operating under confidentiality agreements with participants to preserve anonymity and avoid potential breaches of competition law. Benchmarking can be undertaken at different levels to drive performance improvement in specific areas.

Key areas for benchmarking on capital projects are:

- Project Performance
- Supply Chain Performance
- Design Effectiveness

Supporting Value Enhancing Practices:

VEP 8.1 Performance Benchmarking
VEP 8.2 Contract Monitoring and Measurement

SECTION 3

ACTIVE VALUE ENHANCING PRACTICES

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SECTION 3

ACTIVE VALUE ENHANCING PRACTICES

The 23 ACTIVE Value Enhancing Practices (VEPs), are included in the following section of the Workbook, grouped under the eight ACTIVE Principles (APs) as follows. Supporting Attachments are included at the end of each VEP where appropriate.

AP1 Effective Project Concept and Definition

VEP 1.1 Project Process

VEP 1.2 Project Definition and Objectives

VEP 1.3 Project Planning
Attachment 1.3-A Check List for Planning

VEP 1.4 Value Analysis
Attachment 1.4-A Life Cycle Costing

VEP 1.5 Safety, Health and Environment
Attachment 1.5-A Techniques Relating to Safety, Health and Environment Issues

VEP 1.6 Information Management Strategy
Attachment 1.6-A Preparation of Project Information Strategies

VEP 1.7 Procurement Strategy

AP2 Effective Project Team Management

VEP 2.1 Project Team Organisation
Attachment 2.1-A Selection of Project Organisation: Questionnaire

AP3 Effective Supply Chain Relationships

VEP 3.1 Procurement Cycle Management

VEP 3.2 Supplier Selection

VEP 3.3 Contract Dispute Resolution

AP4 Effective Information Management and Communication

VEP 4.1 Information Management

AP5 Effective Project Risk Management

VEP 5.1 Project Risk Management
Attachment 5.1-A Check List for Sources of Project Risk

VEP 5.2 Risk and Benefit Framework Agreements
Attachment 5.2-A Examples of Key Success Criteria
Attachment 5.2-B Sample Framework Agreement
Attachment 5.2-C Post Project Check List

AP6 Effective Innovation and Continuous Improvement

VEP 6.1 Continuous Improvement
Attachment 6.1-A Methods for Assisting Continuous Improvement

VEP 6.2 Innovation and Intellectual Property

AP7 Effective Project Execution

VEP 7.1 Project Control
Attachment 7.1-A Check List for Project Control

ACTIVE PRINCIPLE 1

EFFECTIVE PROJECT CONCEPT AND DEFINITION

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ACTIVE PRINCIPLE 1

EFFECTIVE PROJECT CONCEPT AND DEFINITION

The construction of an engineering project is part of a business investment process which should be the responsibility of an appointed project owner or sponsor. For the definition and execution of the capital project the project owner should ensure that a managed project process is in place with appropriate stage gates to control the process, and a project manager appointed.

At the outset of the project, the project manager should ensure that a process of concept development and definition is thoroughly completed. This must identify the commercial and technical objectives for the project, tested against the business drivers, and clearly present the success criteria against which the project will be judged.

In this process, key questions to be addressed are:

- Why is this project being considered?
- What are the scope and boundaries of the project?
- How will the project be executed?

An essential requirement is that all key project team members, whether from within the project owning organisation or external in the supply chain, should be involved at an appropriate stage in this process. This is necessary to ensure a common understanding of project goals, reinforced by an alignment and commitment to those goals by all those involved in the project, or with a stake in the outcome.

While this process will probably entail a series of iterations and evaluation of options as proposals are tested against business objectives, it is important that the outcome should include a clear, unambiguous statement, agreed by all parties, of project objectives, scope and implementation strategy before the actual implementation proceeds.

In the front end definition process, the scope of the project must be established in sufficient detail to assure the sanctioning authority that the investment objectives can be delivered and that the proposal represents value for money at an acceptable level of risk. At this stage it is important to employ practices to enhance the value of the project by challenging assumptions, considering alternative innovative solutions and rigorously testing the technical basis of proposals. Techniques such as risk assessment and value analysis are critical at this stage.

It is important that the outcome of this definition process provides a clear and unambiguous brief of requirements to those who have to execute the project, who themselves should be fully involved in the definition process. The scope documents should not only state what is included in the project, but also that which is excluded from the scope.

The implementation strategy should address all the key aspects of the project implementation process and should, as a minimum include strategies for:

- Project management and control
- Project organisation and resourcing
- Communications
- Information management
- Safety, health and environmental policy
- Procurement
- Co-ordination procedures
- Innovation and application of technology
- Management of key external interfaces

In developing these strategies, it is essential to involve the project execution team fully, since these strategies will form the basis of all subsequent activities to achieve the completion of the project. Together with the project scope, they form the basis for the project work breakdown structure, schedules, resource plans and cost estimates on which the project will be authorised.

Supporting Value Enhancing Practices:

VEP 1.1	Project Process
VEP 1.2	Project Definition and Objectives
VEP 1.3	Project Planning
VEP 1.4	Value Analysis
VEP 1.5	Safety, Health and Environment
VEP 1.6	Information Management Strategy
VEP 1.7	Procurement Strategy

ACTIVE VALUE ENHANCING PRACTICE

No. 1.1 PROJECT PROCESS

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ACTIVE VALUE ENHANCING PRACTICE

No. 1.1 PROJECT PROCESS

Purpose and Benefit

This ACTIVE VEP describes a generic project process which can be used for all types and sizes of capital engineering projects. It defines a series of stage gates which ensure that all project activities are integrated in a measurable and manageable process, ensuring that project objectives are successfully .

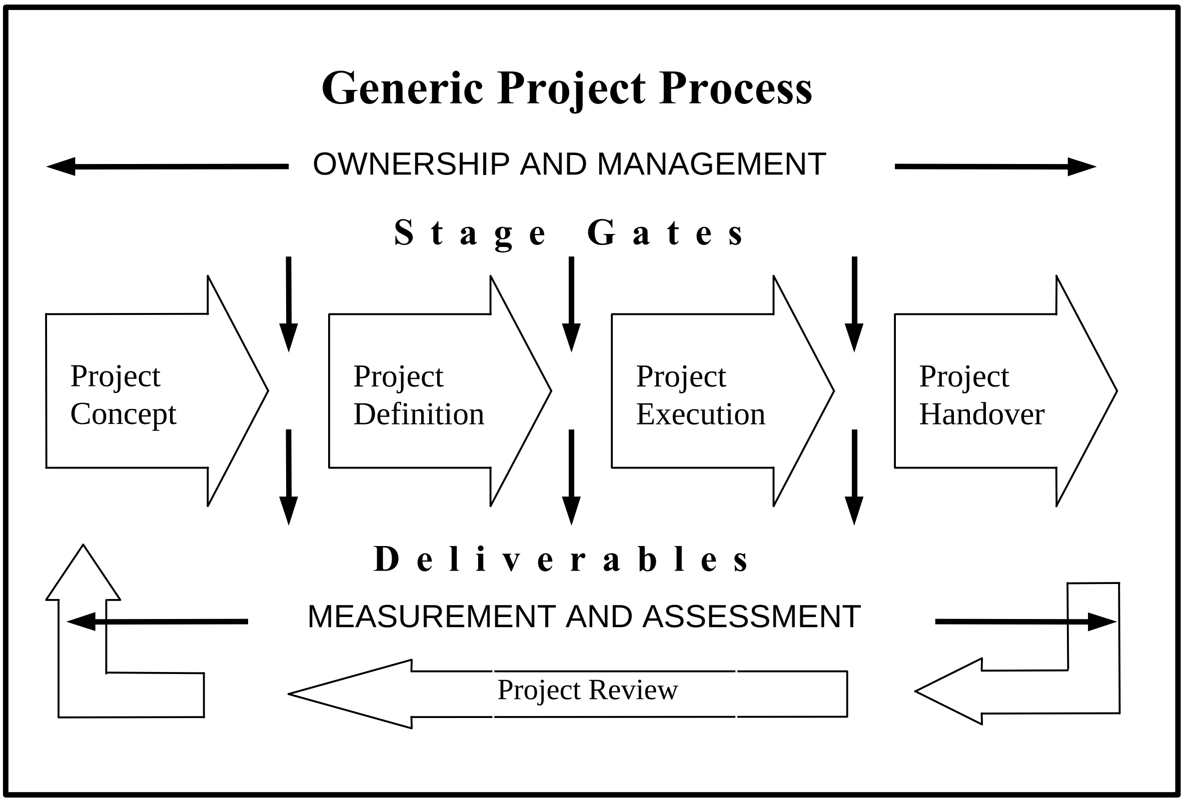
Essential Activities

The essential process is shown in Attachment 1.1-A and consists of the following elements which are described in the Guidelines for Implementation below:

- Project Concept
- Project Definition
- Project Execution
- Project Handover
- Project Management
- Measurement and Assessment

Guidelines for Implementation

ACTIVE VEP 1.1 defines a structured project process that can be used for all types and sizes of capital projects. The project process should be part of a total business investment process which ensures that capital and revenue resources are spent effectively. It should also ensure that key safety, health and environmental standards are met. The project process is set out diagrammatically below and basically defines key stage gates and decision points for a project. The way in which these stages are progressed entails using detailed project procedures appropriate to the nature and size of the project, and the local business context. For larger or more complex projects, additional stage gates may be required.



The key stages of a typical project process are as follows:

1.1.1 Project Concept

The project owner should determine the nature of the project opportunity, should review alternatives and identify the potential risks and benefits before defining the business objectives for the project. The decision to proceed with the project and to provide appropriate resources is a key decision and should be recorded and communicated to the project team. Key deliverables at this stage gate should include a statement of the business objectives for the project with an initial view of the forward programme and likely resource requirements.

1.1.2 Project Definition

The project definition stage will test that the business objectives are clear and establish critical success criteria for the project. The scope of the project should be defined in sufficient detail to satisfy the criteria required for authorisation. Planning of the execution of the project should be undertaken to define roles and responsibilities, resourcing requirements, schedules based on an appropriate work breakdown structure and estimation of costs. Deliverables at this stage should include a defined project strategy, definition package, project schedule and cost estimate.

1.1.3 Project Execution

Following authorisation, project execution should proceed in accordance with the defined project strategy and scope. The stages of execution may vary with the nature of the project but usually will include detailed design, procurement, construction and start up. Appropriate monitoring, validation and control measures will be employed to track progress, control costs, ensure safety and limit change to ensure the project objectives are achieved. The deliverable at this stage gate is a productive asset which meets the business objectives.

1.1.4 Project Handover

The project owner should check that the project objectives defined at the outset of the project have been achieved and formally accept the project by signing it off as complete.

1.1.5 Project Review

It is good practice for projects to complete an appropriate review process which ensures that learning from the project, both positive and negative, is captured and recorded. Appropriate mechanisms should be in place to ensure such learning is effectively disseminated throughout all organisations involved in the project to complete the feedback loop for continuous improvement.

1.1.6 Project Management

It is important that capital projects are effectively managed throughout the complete project process with an identified project manager responsible for delivery of the project objectives and for managing the integration of activities throughout. The project manager has responsibility for ensuring that the capability is in place for the effective delivery of all stages of the project process, and must further ensure that essential safety, health and environmental requirements are met throughout the project. Continuity of the project manager and other key project team members has been shown to be a significant factor in achieving project success.

1.1.7 Measurement and Assessment

Each stage of the project process requires the definition of key deliverables. These deliverables form the basis for decisions to be made to proceed or otherwise to the next stage of the project process. It is important that the deliverables are measurable and that suitable project assessments are carried out from time to time to ensure that the process is being effectively and consistently applied. These can take the form of self assessments or may be peer assessments or independent reviews.

Workbook Cross References

VEP 1.2	Project Definition and Objectives
VEP 7.1	Project Control
VEP 7.5	Project Handover and Commissioning

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 1.1 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE VALUE ENHANCING PRACTICE

No. 1.2 PROJECT DEFINITION AND OBJECTIVES

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ACTIVE VALUE ENHANCING PRACTICE

No. 1.2 PROJECT DEFINITION AND OBJECTIVES

Purpose and Benefit

This ACTIVE VEP addresses the need to articulate, test and communicate the commercial, technical and regulatory objectives of a project, both prior to its start and during the execution phase. This is the stage of a project where maximum value can be gained by employing sound definition processes and clarity of objectives. Firm definition of scope and a sound implementation strategy are essential ingredients of a successful project.

A project will only meet the owner’s business requirements and deliver cost effective solutions if the objectives, scope and the basis for performing the work are explicitly defined with clear success criteria articulated. It is important that this process should be completed prior to commencing the execution phase of the project.

Essential Activities

The Essential Activities to be undertaken during project definition that will lead to an efficient, cost effective project are as follows:

- Establish and define the project's objectives, based upon the business case made for the project by the project owner, rigorously test project assumptions and review other options.
- Clearly define the boundaries for the project.
- Develop and test the scope of the project in sufficient detail to assess technical and commercial feasibility.
- Develop and define the strategy for executing the project.

The Essential Activities are discussed in more detail in the following Guidelines for Implementation.

Guidelines for Implementation

1.2.1 Guidelines for Establishing Definition of Project Objectives

It is essential that the objectives of the project, based upon the business case supporting the project, are clearly articulated, understood and agreed by the project owner. The objectives should be subjected to rigorous testing against alternative options to ensure that the optimal project is defined. A thorough understanding of the risks and potential benefits from the various project options is necessary if the best value project is to be obtained. In order to do this it is desirable to involve the parties who will be responsible for the execution of the project at an early stage, to help evaluate the options and bring innovative solutions to the table which may benefit the project.

In order to ensure that the subsequent project definition and development of an execution strategy are focused on meeting the requirements of a project in full, a detailed statement which clearly explains the key business drivers, project objectives and potential constraints and variables is required for communication throughout the project team.

The key success factors of the project owner should be stated openly to all participants. The key measures of success must be clear prior to the start of any design, procurement, construction or other activity. Typical project parameters which must be clearly understood before definition proceeds include:

- The key programme requirements including key events, milestones and any interdependencies
- Key supply chain relationship requirements
- Constraints on cost
- Broad scope of project in terms of functionality and operability, defining inclusions and exclusions
- External factors which may impact on the project
- Key technologies which will be employed
- Product quality output targets
- Design standards
- Safety, health and environmental requirements
- Availability and reliability requirements for plant operating at design capacity

Without definition or appreciation of these parameters at the outset of the work, difficulties and inefficiencies will be encountered during project execution in relation to developing procurement strategies, resource plans, mobilisation plans, arrangements with vendors and subcontractors, and other activities which can directly influence the outcome of the project.

1.2.2 Guidelines for Defining Project Boundaries

It is important that exclusions from the project are clear at the outset. A process for agreeing the firm scope of the project, both within the project team and also those outside the team but with a stake in the project's outcome, is essential to avoid problems later. Failure to define the scope of the project fully and to communicate this properly to all the parties involved is likely to increase both costs and the chance for disputes to arise during project execution.

For supply chain partners working with the project owner, a statement of the boundaries for the project is essential for the accurate determination of scopes of work, budgets, programmes, liabilities, and recognition of interdependencies.

1.2.3 Guidelines for Developing and Testing Project Scope

The project team will be responsible for developing the project scope as part of the definition of the project. This should also include the scope of goods and services to be procured, defining the responsibilities of the contracting parties and clarifying interfaces. Scoping will focus on defining functional requirements, thereby encouraging innovative ways of meeting the performance criteria.

Clarity of scope is crucial to effective performance by the project execution. Problems with scoping often have their root cause in inadequate clarity of objectives or poor articulation of objectives by the project owner.

The most successful projects are those where the team has applied a rigorous process for reviewing assumptions and assertions in the scoping exercise. Contractors and suppliers working in the project team are sometimes reluctant to do this on the mistaken assumption that the 'client is always right' but much value can be added at this stage by a questioning approach by the team. A good supplier at this stage can often persuade the buyer to check within their own organisation on whether the proposed scoping assumptions are secure. It has been traditional in the industry for operating companies to define requirements for scope of supply in great detail, leaving little room for suppliers to develop ways of meeting requirements more cost effectively. Functional specifications, where the buyer defines functionality requirements but leaves the vendor to define how that functionality is achieved, has been used to great effect within the offshore industry's CRINE initiative as a way of simplifying the procurement process, encouraging innovation by suppliers and reducing overall costs. Where possible, it is recommended that this functional approach should be adopted.

Project scoping should be developed to a sufficient level of detail to assure the project owner that the project will meet the business objectives against a defined probability of success. This will normally be tested by a project risk assessment (see ACTIVE VEP 5.1) which will identify those areas which require further work in definition to assure the owner that the objective can be achieved. It is also important that value analysis and other value enhancing practices are employed at this stage to assure everyone that the project is optimised for in meeting the business objectives (see ACTIVE VEP 1.4).

1.2.4 Guidelines for Developing an Execution Strategy

The strategy for executing the project must be developed by the project manager working with the project team to enable the job to be accurately planned and priced. Failure to generate a robust plan is likely to lead to cost overruns, programme extensions, and the raising of commercial contract issues.

Prior to the start of a project it is important that the team considers the strategies to be used during the project execution phase. This requires the team to evaluate:

- Project management and control
- Project organisation and resourcing
- Communications
- Information management
- Safety, health and environmental policy
- Procurement
- Co-ordination procedures
- Innovation and application of technology
- Management of key external interfaces
- How the work will be performed and controlled
- When activities will take place
- How manpower resources will be mobilised
- Possible sources of materials and equipment
- Application of expertise and technology

In the absence of an execution strategy the project is likely to begin haphazardly, without due recognition being given to events that will occur in later phases of the project. This will likely result in the project experiencing delay and cost overruns.

The project team should develop an execution strategy which recognises:

- Project targets and programme
- Technical challenges and risks
- Culture and aims of the operator
- Available resources
- Interfaces with client, other contractors, suppliers and regulatory bodies
- Political and legislative requirements

The procedures and techniques which can be beneficially applied to support project execution are addressed within subsequent ACTIVE Value Enhancing Practices.

Workbook Cross References

VEP 1.1	Project Process
VEP 1.4.1	Guidelines for Establishing Performance and Project Objectives
VEP 2.1.13	Guidelines for Setting Aggressive Achievable Targets
VEP 3.1.8	Guidelines for Scoping
VEP 5.1	Project Risk Management
VEP 6.2	Innovation and Intellectual Property
VEP 7.2.1	Guidelines for Pre-Design
VEP 7.3	Constructability
VEP 7.4.1	Guidelines for defining standards during project definition
VEP 7.5	Project Handover and Commissioning
VEP 8.2.1	Identify Procurement Goals

Further Reading

CII IR113-2. Project definition rating Index (PDRI): Industrial Projects. Measurement tool.
CII 113-1. Pre-project Planning Tools: PDRI and Alignment. Research summary.
CII SP 39-2 Pre-Project Planning Handbook. Video.

For CII contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 1.2 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE VALUE ENHANCING PRACTICE

No. 1.3 PROJECT PLANNING

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ACTIVE VALUE ENHANCING PRACTICE

No. 1.3 PROJECT PLANNING

Purpose and Benefit

Application of ACTIVE VEP 1.3 will assist with developing methods for forecasting project requirements which provide the basis for decisions and project control.

Planning is a sequence of activities, each with a specific input (material, labour or process) and time to complete, which together provide the basis for the delivery of the total project. The sequence of the programme will define the critical path and identify any float in other activities. The information generated will greatly assist the development of the full scope of the work and help to articulate the objectives of the project in quantifiable terms by forecasting all key aspects of the project, including time, cost and resources.

Planning also provides a communication tool to disseminate information and issue instructions to the project participants. The identification of the critical path reduces project risk and uncertainty.

Planning provides the basis for actual performance to be measured, which will in turn identify any necessary controlling or corrective action.

Essential Activities

At the start of the project, planning tools are used for the estimation of costs, time schedule and resources. The estimate is developed in more detail during the execution phase as more exacting needs for project control and reporting become necessary. The essential activities of the planning process are:

- **Supporting systems and tools**

  The provision of software tools and resources necessary to support a planning and control system.

- **Estimating and planning**

  The definition of project activities, estimates of their duration, value and interrelationship.

- **Forecasting**

  The forecasting of key project measures including costs, time schedule and resources.

Each of the essential activities is addressed in more detail in the following Guidelines for Implementation**.** A check list for planning and control is included in Attachment 1.3-A.

Guidelines for Implementation

1.3.1 Guidelines for Supporting Systems and Tools

The project organisation requires the necessary infrastructure to support planning tools. Planning techniques should be used to focus efforts on the critical project elements and to establish key project priorities.

Planning software

It is essential that all parties agree and contribute to the final plan. It can be useful to establish a common standard software planning package together with the necessary skilled resources, but this is not essential if all parties have a common understanding of the programme requirements. There are a number of standard software systems available to match the complexity of the project. Consider adopting the selected standard package for all parties in the project process.

Organisation structure

The roles and responsibilities of the planning function must be clearly defined in the overall structure of the project. Ensure that responsibilities for all elements of the project plan are recognised and understood, and that an adequate level of knowledge and experience is available. It is important that overview planning at this early stage is properly completed.

Level of programme

Define clearly the planning programme summary levels (1, 2 or 3 etc.) and their purpose within the planning structure. It is important that the accuracy and validity of programmes at each level are defined and understood.

Procedures

The procedures in all other primary and secondary processes, for example engineering, procurement, construction and commissioning, must be compatible with the project planning system, particularly in definition of activities and scheduling of information.

1.3.2 Guidelines for Estimating and Planning

The accuracy of the estimates and input data for each activity will dictate the accuracy of the overall programme.

Work breakdown structure

All activities, including design and engineering tasks, should be defined as part of an overall work breakdown structure. This represents the project scope and defines and displays all of the work to be performed in accomplishing the project goals.

Definition of activity

The definition of a project activity must be explicit and eliminate uncertainty in the definition of the scope of the work. The activity identification should contain a code to identify sub groups etc.

Activity sequence

The sequence of the activity, or logic, and its relationship with other activities must be understood. Consider the use of cross functional teams to ensure the involvement and ownership of the total project team.

Units of measurement

The activity must include appropriate units of measurement (time, cost, resources etc.)

Software deliverables

The planning process should include all key software deliverables such as engineering drawings and documentation.

1.3.3 Guidelines for Forecasting

The project planning systems should include forecasting capability for:

Critical path and float

Assessment of the programme risk. Consideration can be given to contingency planning in the event of delay or impact to the critical path.

Resources

Comprehensive histograms are required for forward planning of manpower resources.

Capital expenditure

Prediction of cost expenditure for manpower, equipment and materials during project execution.

Workbook Cross References

VEP 6.1	Continuous Improvement
VEP 7.1	Project Control
VEP 7.3	Constructability
VEP 7.5	Project Handover and Commissioning
VEP 8.2.2	Developing a Flowchart of Procurement Cycle Activities

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 1.3 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

1.3-A Check list for Planning.

ACTIVE VALUE ENHANCING PRACTICE

No. 1.3 PROJECT PLANNING

ATTACHMENT 1.3-A

CHECK LIST FOR PLANNING

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ATTACHMENT 1.3-A

CHECK LIST FOR PLANNING

		Yes	No
1.	**GENERAL**		
1.1	Have procedures been agreed for:		
	Estimating?	☐	☐
	Scheduling?	☐	☐
	Cost Control?	☐	☐
1.2	Have responsibilities for all elements of the works been defined?	☐	☐
2.	**ESTIMATING**		
2.1	Has the estimate been generated in a manner which permits costs to be traced back to supporting calculations/assumptions?	☐	☐
2.2	Have the calculations been based on standard work rates, quoted prices, etc.?	☐	☐
2.3	Have you carried out a risk analysis?	☐	☐
2.4	Has sufficient contingency been allowed?	☐	☐
3.	**PLANNING**		
3.1	Does the project plan recognise start up as part of the overall requirement?	☐	☐
3.2	Does the project plan detail engineering activities e.g. design, and material deliverables?	☐	☐
3.3	Does the project plan recognise installation works should not proceed until adequate levels of information and materials are available to maintain production?	☐	☐

3.4	Have you defined planning levels and who should utilise these, e.g. overall plan - project management, short term look-a-heads - construction management etc.?	☐	☐
3.5	Have resources been established for each activity utilising standard or supportable, repeatable work rates?	☐	☐

ACTIVE VALUE ENHANCING PRACTICE

No. 1.4 VALUE ANALYSIS

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ACTIVE VALUE ENHANCING PRACTICE

No. 1.4 VALUE ANALYSIS

Purpose and Benefit

Value analysis is a value enhancing process for analysing systems, equipment, facilities, services and supplies with the aim of achieving the essential functions of a facility at the lowest life cycle or through-life cost. While cost reduction is the primary goal, the functions of the facility must meet the required performance and standards of quality and safety.

The value analysis process is used to identify alternative design solutions or strategies using numerical models to compare through-life costs and benefits, and to assess the optimum level of capital efficiency. In this way, informed and objective decisions may be made regarding alternative development options and the provision of facilities which maximise value.

It must be recognised that the potential for improving long term value reduces as the project proceeds through its life cycle and hence the value analysis technique is most effective when applied during the definition stage of projects. Nevertheless there is benefit to be gained by applying the process at other stages of the project life cycle.

Essential Activities

- **Establish performance requirements and project objectives**

  These should include financial and non-financial parameters, for example costs and revenue data, schedule and resource constraints, and targets for reliability, availability, safety and environmental performance of the facility.

- **Identify the options and assess life cycle costs**

  Determine which options are likely to achieve the project's goals and measure their relative value by assessing benefits and technical performance against whole life costs and risks. Select the options which present the optimum value.

Seek continuous improvement

As the project progresses, effort should be made to improve the selected options by continuously comparing functional requirements against objectives.

The above activities are essentially challenge-orientated and are often best undertaken through a series of independently facilitated team workshops at distinct stages during the project life cycle. The following Guidelines for Implementation provide more details.

Guidelines for Implementation

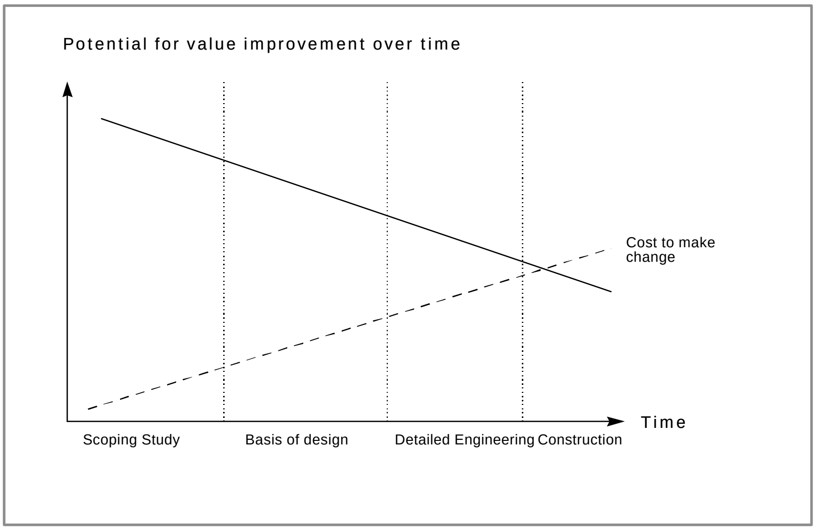
1.4.1 Guidelines for Establishing Performance and Project Objectives

This activity is best carried out either in a series of independently facilitated team workshops, or by an assigned value manager.

Information should be gathered which presents:

- A background to the project
- The relative importance of various project objectives
- Proposed options and design solutions
- Economic models and/or cost models to be used
- Key constraints

It must be recognised that opportunity for the greatest value improvement generally occurs at the earlier stages of a project as indicated below:



The value analysis process comprises two broad stages. The first stage, known as value planning, seeks to verify the critical performance objectives that must be met and then identify conceptual options that best meet them. Once a broad option has been selected, value engineering then aims to optimise capital efficiency by seeking design solutions which maximise benefit (both in financial and non-financial terms) while minimising through-life costs. Value engineering is more technical and takes place during design development when sufficient information is available to compare different solutions to the project's functional objectives.

1.4.2 Guidelines for Identifying Options and Assessing Life Cycle Costs

This activity is also best carried out either in a series of independently facilitated team workshops, or by an assigned value manager.

The key tasks are:

- Identify, without pre-judging, options that may meet objectives and offer value enhancement by increasing performance, reducing cost, or both
- Identify advantages, disadvantages, benefits, whole life costs and risks associated with each option
- Compare options by applying financial parameters, for example NPV from revenue versus whole life costs; non-financial parameters, for example safety, environment, and public relations; and risks, for example costs, time and perceived benefits.
- Select option(s) that meet the project goals and present the most favourable commercial outlook.

1.4.3 Guidelines for Seeking Continuous Improvement

This activity is most usefully undertaken by a value manager in a continuous mode during the detailed design phase of the project. Opportunities to improve the design should be pursued through a formal procedure under the control of the value manager. The key tasks are:

- Identify alternative design solutions for key components and overall design which meet functional objectives while providing maximum benefit at minimum life cycle cost
- Select the options

1.4.4 Guidelines for Value Workshops

Independently facilitated value workshops are essentially challenge-orientated. Their purpose is to seek to promote the generation of alternative and innovative solutions to optimise value. The usefulness of independent facilitation is to help open the minds of the project team to options which represent departures from current thinking on the project, and to help with addressing broader issues as well as more detailed aspects.

Value workshops usually comprise three stages; pre-workshop, workshop and post-workshop. The contents of each are described below:

Pre-workshop

Before the workshop, information should be gathered to enable informed and objective decisions to be made at the workshop. This may include an orientation meeting between the facilitator and project representatives, and the preparation of key information including: economic models (which provide discounted cash flow analysis of whole life revenue versus capital and operating expenditure), programme/schedule information, and functional cost models (which allocate whole life costs to functions rather than elements).

Workshop

The workshop should involve various stakeholders and disciplines, for example designers, operators, vendors, fabricators, finance and marketing, and will generally run for 1 to 3 days (in the UK). It should follow a structured job plan which comprises the following stages (or equivalent):

- Information stage to present background information, proposed options/design solutions, economic models and/or cost models and key constraints.
- Function stage to identify and establish relative importance of various objectives and/or to identify functions performed by various elements of the project.
- Creative stage to identify (without judgement at this stage) options that may meet objectives and/or alternatives to proposed solutions that offer value enhancement (by increasing performance, reducing cost or both).
- Evaluation stage to select ideas with merit and reject those without.
- Development stage: to identify advantages, disadvantages, benefits, whole life costs and risks associated with ideas or options.
- Implementation stage to conclude which ideas or options to select and include within the project.

Post-workshop

Due to the limited time available during the workshop, further technical development may be required. Following further development the project team should take the actions necessary to implement the agreed proposals.

Workbook Cross References

VEP 1.2	Project Definition and Objectives
VEP 1.7	Procurement Strategy
VEP 5.1	Project Risk Management
VEP 6.2	Innovation and Intellectual Property
VEP 7.2.2	Guidelines for Design

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 1.4 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

Attachment 1.4-A Life Cycle Costing.

ACTIVE VALUE ENHANCING PRACTICE

No. 1.4 PROJECT PROCESS

ATTACHMENT 1.4-A

LIFE CYCLE COSTING

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ATTACHMENT 1.4-A

LIFE CYCLE COSTING

1. Introduction

Life cycle costing is a systematic process which considers all relevant costs (including capital and operating expenditure) and revenues associated with the acquisition, ownership and decommissioning of an entire asset or its individual component parts. The process is an iterative one involving estimating, planning and monitoring of costs and revenues throughout the life of the asset. This information is used as a basis for decisions, particularly during the early phases of a project, and provides a quantitative tool for evaluating alternative technical and development options.

The benefits of using a life cycle cost approach to differentiate between competing options include:

- Overall value of an asset will be maximised
- Ownership costs can be better controlled
- Major cost drivers can be identified, targeted and reduced

2. Key Actions

- Agree a strategy and form a plan. Recognise that the process is iterative.

- Adopt a recognised and accepted model (or a methodology which has been tried and tested) with well defined steps. Tailor the process to suit the project.

- Consider all the relevant costs and revenue associated with the acquisition, ownership and decommissioning of an entire asset or its components.

- Agree in advance the criteria to be used in deciding on competing options, for example NPV, IRR.

- Identify and involve the potential stakeholders (internal & external), and the team members who will add value to the process.

2.1 Agreeing a Strategy and Plan

The most important activity which needs to be carried out in advance of any detailed studies is the agreement of a strategy and plan. Agreement will need to be reached on the following:

- The option decisions which will be taken after consideration of life cycle costing.
- The individuals or organisations which will be accountable for the work.
- The competence and training needs of all those involved.
- The timing of the work and how this relates to the project programme.
- The methodology to be applied.

2.2 Adopting a Methodology

A suggested methodology is defined below but alternative methodologies may be equally valid provided these are shown to be better for the specific options being considered. The suggested methodology has been proved to be effective through a number of case studies and comprises the following steps:

Step 1: Diagnosis and scope

- Identify the objectives
- Identify the constraints
- Establish the decision criteria
- Identify potential alternatives
- Establish options
- Define boundaries
- Review and feedback/iterate

Step 2: Data collection and structured breakdown of costs

- Identify potential cost drivers
- Define cost elements
- Establish structured breakdown of costs
- Identify and collect data
- Review

Step 3: Analysis and modelling

- Develop whole life cost model
- Analysis and assessment
- Sensitivity analysis
- Review

Step 4: Reporting and implementation

- Identify optimum design solution based on through life cost benefit
- Confirm solution against the constraints of resourcing, programme and delivery
- Report and confirm decision
- Implement

2.3 Assessing Other Models

The capability of vendors and contractors to support life cycle costing methods can be determined by examination through questionnaires, for example those issued by the company 1st Point Assessment Ltd. (refer to Section 5 for contact details). Working through the methodology in partnership with vendors and contractors who are skilled in the use of the techniques is likely to be more effective than imposing contracts on a whole life cost basis.

Norsok, the Norwegian oil industry cost reduction initiative, has standards on life cycle costing which provide detailed calculation methods and spreadsheet models. The standards can be used to support a number of the steps in the whole life cost methodology. Norsok's contact details are included in Section 5.

ACTIVE VALUE ENHANCING PRACTICE

No. 1.5 SAFETY, HEALTH AND ENVIRONMENT

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ACTIVE VALUE ENHANCING PRACTICE

No. 1.5 SAFETY, HEALTH AND ENVIRONMENT

Purpose and Benefit

ACTIVE VEP 1.5 provides guidance on the creation and application of policies for safety, health and the environment (SHE), and related project systems, standards and training. Applying this VEP in a thorough and responsible manner will protect and safeguard people, assets and the environment throughout the life cycle of the project.

The inclusion of SHE issues into all stages of planning and development of a project minimises the risk of adverse responses to, or impacts on, the project and its subsequent operation. Recognising and accepting that SHE issues are likely to have effects on design, construction and operation early in the project life cycle permits the development of optimum solutions. Documentation of SHE issues and the responses generated to these in the project will ensure that a solid basis exists for later evaluation of any actions needed to respond to changes in circumstances.

Essential Activities

Safety, health and environmental issues and their interaction should be recognised and taken into account from the inception of a project. As work moves from concept through design, construction and operation phases, specific SHE activities change from those oriented towards design and equipment to those concerning training and safety, health and environmental management. The essential activities are:

Prepare a SHE policy

The genuine commitment of senior management to safety, health and environmental issues should be reflected in a policy addressing the specific issues of the project.

- **Appoint competent persons**

  Legislation relating to SHE frequently requires the appointment of one or more individuals or organisations with specific responsibilities and authorities.

- **Determine critical functions and identify inherent hazards**

  Assess the project to determine which systems or operations are critical with respect to safety, health or the environment. Determine the fundamental characteristics of the project which possess the potential to harm people, the environment or the asset and facilities.

- **Seek inputs on SHE issues**

  Recognise that all participants in the project are valuable sources of ideas and methods for addressing and generating improvements to project objectives.

- **Maintain thorough records**

  An essential ingredient of SHE activity is the recording of project history with reference to how the initial and subsequent decisions on policy and strategic issues were transformed into design features and operational philosophies.

The Essential Activities are developed in more detail in the following Guidelines for Implementation. Attachment 1.5-A provides additional information on typical techniques employed by industry for SHE issues.

Guidelines for Implementation

1.5.1 Guidelines for Preparing a SHE Policy

A SHE policy should be brief. It is not a document for detailed listing of the many factors which will be evaluated in the course of planning and executing the entire project life cycle.

However, it should be firm, clear and avoid vague generalisations. The applicability of any existing policy to the particular location or function of the project should be examined.

The project's SHE policy should reflect the policy of the eventual operator of the facility and be fully consistent with overall corporate policy and objectives. Commitment to SHE issues will almost invariably, at some point in the life cycle of the project, require expenditure of additional capital or operating funds such that these become visible outside the project. At that time it is helpful if there is a link between project activity and corporate commitments.

The policies of the design contractor should also be reviewed. Any mismatch in the attitudes which lead to development of the project SHE policy, or with the culture of the society in which the project will be constructed and operated, is likely to lead to conflict during design, construction and operation. It is essential that there is also a clear understanding within the project of the owner's position in respect of non-mandatory aspects of SHE issues.

When forming the SHE policy it is advisable that some degree of commitment is made voluntarily within what is generally a mandatory situation. As part of the wider need to generate pride and enthusiasm for the project and its acceptance, it is helpful to make commitments which go some way beyond the legal minimum. For example, commitments on safety targets during construction may help when decisions are needed about how much time should be spent in reinforcing safety aspects of the induction course for site workers. A commitment to protect the habitat of local animal species tells the public that the project recognises the importance of outside issues.

It is important that the person(s) responsible for implementation of the SHE policy are identified as well as ensuring that key SHE activities and constraints are built into the project programme to avoid potential costly delays.

1.5.2 Guidelines for Appointing Competent Persons

Legislation relating to SHE frequently requires the appointment of 'competent' persons or organisations to undertake specific responsibilities on the project. Although these requirements tend to look exhaustive and sometimes even oppressive on paper, the reality is that much of the prescribed activity would normally be undertaken by a responsible owner and project team. The competent person must ensure that SHE issues are adequately addressed, including:

- Identification of appropriate legal, regulatory and other requirements
- Checking that techniques used for determination of regulatory compliance in respect of SHE issues are appropriate to project type and legal jurisdiction (refer to Attachment 1.5-A)

- Identification of SHE targets to be met by all participants in the project
- Monitoring the development and implementation of plans addressing SHE issues throughout the life cycle of the project
- Ensuring purchase and subcontract conditions address SHE issues in conformity with the overall policy of the project
- Ensuring safety indications and follow-ups are implemented at appropriate times and places
- Monitoring, auditing and reporting on the performance of construction teams
- Auditing the implementation and effectiveness of SHE management plans
- Compiling and presenting SHE records

It is important to note that many of the above actions would be carried out by a competent project team irrespective of the existence of specific legislative requirements.

1.5.3 Guidelines for Determining Critical Functions and Identifying Inherent Hazards

Not all activities, procedures or equipment on a project are critical. Resources expended in detailed examination of criticality are frequently insufficiently focused.

Criticality of function should be assessed in the context of primary function and with regard to the impact of failure. For example, short term partial failure of a vent condenser may be a non-critical event because the subsequent increase in emissions is not large, but it may also lead to a process safety problem because of loss of solvent from the reaction vessel.

Criticality should be assessed by:

- Identifying inherent hazards on the project
- Identifying systems, equipment and procedures where malfunction could lead to potential hazards.
- Determining the criticality of such systems, equipment and procedures in terms of both the likelihood of an event and potential consequences.
- Performing risk assessments and developing method statements appropriate to the project.
- Reviewing design proposals for SHE implications via techniques including safety and operability studies (refer to Attachment 1.5-A), constructability reviews, maintainability assessments and reviews of the emergency response plan.

1.5.4 Guidelines for Seeking Inputs on SHE Issues

Everyone involved in or associated with a project will have views on these issues. The views may range from mild concern to intense or even obsessive commitment. It can be difficult to deal with such concerns, particularly early in the project when definitive responses to apparently simple queries may be either commercially sensitive or not yet available. A project team must, however, be aware that such concerns rarely go away unless addressed.

A willingness to accept SHE inputs from all sources and to act on these as appropriate is a key factor in moving a project forward. This may divert resources from other issues at inconvenient times, but dealing with ideas, suggestions and queries at an early stage is likely to lead to fewer unanswerable objections later. It may even be that early inputs will actually help the project to meet its overall objectives.

Specific actions to be considered include:

- Explaining to the general public at the outset of the project as part of a Responsible Care Programme, the objectives and reasons for the development
- Using cross-company SHE meetings for knowledge transfer and identification of solution opportunities
- Working with regulatory and other authorities from the start of the project.

1.5.5 Guidelines for Maintaining Thorough Records

A complete record of the decisions leading to the final appearance and content of the project will be needed to permit responses to any actions instigated against the project at any time in its life cycle. A project should initiate the keeping of thorough records on issues impacting SHE from the outset. The key requirement is to identify which features resulted from which decisions.

Key actions include:

- Document the basis of the project, the changes involved and the timing and reasons for those changes
- Maintain a SHE file of issues raised and the responses and actions generated
- Prepare and maintain an environmental impact assessment in appropriate depth for internal project purposes even if not specifically required by project type or regulatory regime
- Ensure and record that training programs for participants in the project are adequate and meet the requirements of appropriate industry and statutory bodies
- Record contractors' health, safety and welfare assessments

Workbook Cross References

VEP 1.2 Project Definition and Objectives
VEP 7.2 Design Effectiveness
VEP 7.3 Constructability

Further Reading

CII TF005/2. Total Project Management of Safety, Health and Environment. Report.
CII SD-86. Zero Accident Techniques. Research report.
CII 13-1. Managing Subcontractor Safety. Research summary.

For CII contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 1.5 with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

1.5-A Techniques relating to Safety, Health and Environment practice.

ACTIVE VALUE ENHANCING PRACTICE

No. 1.5 SAFETY, HEALTH AND ENVIRONMENT

ATTACHMENT 1.5-A

TECHNIQUES RELATING TO SHE ISSUES

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ATTACHMENT 1.5-A

TECHNIQUES RELATING TO SAFETY, HEALTH AND ENVIRONMENT ISSUES

Safety, health and environmental (SHE) issues are inter-related on a project, particularly at the detailed level. This inter-relationship must be recognised not only when detailed planning and review is undertaken, but also when overall policies and directives are being formulated. Some of the techniques employed during these activities are discussed below.

Setting Targets

As a basis for setting SHE targets, a clear understanding of the regulatory requirements associated with the project during construction as well as operation are required. Identify as far as is practicable the techniques preferred by the authorities for the assessment of risks and impacts.

Identify at an early stage the primary factors affecting SHE issues. These are typically associated with the nature of the process to be operated, the geographic and geological condition of the site, and the nature of the immediate and middle-distance surroundings of the site. The impact of traffic movements during both construction and operation should also be considered.

Targets for SHE issues could typically include:

- The incorporation of specific review and assessment techniques into the project execution plan
- Values to be used as targets in risk assessments
- Limits for emissions, to be incorporated into the basis of design of the project
- Maximum quantities of materials to be stored on site

Safety and Operability

Activities, reviews and studies to be performed during the design stage of the project include:

- Design safety reviews to examine a design to confirm that, in normal operation, there are no conflicts between the plant function and the capability of the equipment and bulk materials proposed
- Safety and operability studies to examine proposed plant design, based on the concept of deviations from normal operation, leading to identification of problems and hence potential risks
- Constructability reviews to confirm that the proposed plant can be installed and erected in a safe manner
- Maintainability reviews to determine procedures such as isolation of equipment, purging of flammable, toxic or environmentally damaging materials, access to, removal of and re-installation of equipment
- Hazard identification to provide an overview of the project and the identification of its inherent hazards (e.g. chemical reactivity, high pressure operation of plant, etc.).
- Risk identification to determine potential incidents that might arise during the life cycle of the project, and ranking of risks in terms of likelihood of occurrence and severity of consequence
- Hazard quantification to assess the overall risk to life, the environment and property based on a realistic estimation of likely potential incidents, their frequency and their consequences
- The principle of ALARP (As Low As Reasonably Practicable) or equivalent is accepted by many regulatory authorities

Environmental Reviews

Environmental impact assessments and reviews during design and construction planning may not be required by the relevant legislation and regulation, but it is considered good practice to conduct and document these at an early stage of the project.

- The early stages of safety reviews present a suitable opportunity to identify potential environmental issues
- Although some owners are reluctant to approach authorities for guidance in the belief that this may trigger otherwise unnecessary involvement and expense, a project should always consider this option, particularly if the regulatory regime is operated on a non-prescriptive basis. It is always better to find out sooner than later if a proposed course of action could lead to conflict with regulatory agencies.

- Consider taking advantage of the experience and capabilities of consultants specialising in specific geographic areas. These may have a better understanding of the ways in which local authorities apply regulations
- Take advantage of the experience and capabilities of vendors and suppliers of specialist equipment. Much environmental regulation is driven by the capabilities of available equipment and suppliers are likely to be aware of current trends

Training

- Ensure that relevant legislation on the training and experience levels of individuals involved in positions of authority is identified and understood
- Ensure that individuals working on the project are adequately trained in terms of their proposed function and that they are given the information they need to do their work correctly and competently
- Ensure that persons attending the construction site, even in a temporary capacity, are adequately briefed, given appropriate information and direction, and are provided with the protective gear necessary for their function
- Ensure that other contractors working on the project adopt equivalent programmes

Monitoring and Auditing

- Ensure that the project has procedures for monitoring SHE issues and reporting results to an appropriate level in the project organisation
- Audit all design, construction and operations activities on a defined and adequate basis and report and publicise the results within the project

ACTIVE VALUE ENHANCING PRACTICE

No. 1.6 INFORMATION MANAGEMENT STRATEGY

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ACTIVE VALUE ENHANCING PRACTICE

No. 1.6 INFORMATION MANAGEMENT STRATEGY

Purpose and Benefit

ACTIVE VEP 1.6 addresses the preparation of a project information strategy. A strategy should be developed at the outset of the project to cover all aspects of the effective generation and management of information. The strategy should include the responsibilities and processes involved in creating and managing the information, and the preparation for handover to life cycle information systems.

Essential Activities

- **Prepare an information management policy**

  The information management (IM) policy should be generated and owned by the project owner.

- **Prepare a project information strategy**

  A project IM strategy should be developed to maximise the efficiency of project execution for all main participants.

- **Develop information management tools**

  Develop integrated tools to assist with information flow, for example, office automation, electronic design/modelling, and electronic materials management.

- **Establish inter-office communications and infrastructure**

  Facilities must be established for the exchange and sharing of information between project locations.

Provide training

Training should be provided in the use of specific systems and in general awareness of project IM objectives.

Guidelines for Implementation

The Guidelines for Implementation relating to the preparation of project information strategies is a detailed and lengthy document, and is therefore presented as a standalone attachment, Attachment 1.6-A.

Workbook Cross References

VEP 4.1 Information Management

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 1.6 originated with the Information Management Workgroup. Refer to Section 5 for contact details.

Attachments

1.6-A Guidelines for Preparing a Project Information Management Strategy

ACTIVE VALUE ENHANCING PRACTICE

No. 1.6 INFORMATION MANAGEMENT STRATEGY

ATTACHMENT 1.6-A

PREPARATION OF PROJECT INFORMATION STRATEGIES

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ATTACHMENT 1.6-A

PREPARATION OF PROJECT INFORMATION MANAGEMENT STRATEGIES

1 Purpose and Objectives

1.1 Purpose

To contribute to the competitiveness of the UK engineering construction industries by providing guidelines to value enhancing practice in information management, throughout all phases of project execution.

1.2 Objectives

Effective use of information management (IM) in project execution has the objective of significantly reducing the project and life cycle cost of a facility. The efficiency and effectiveness of project execution and handover will be improved by:

- The client planning IM in partnership with the engineering contractor, acknowledging and building on the business leadership set by the client's IM policy
- Integrating IM with, and contributing to, the project execution strategy
- Serving the information needs of all participants and phases of the project through engineering, procurement, manufacture, fabrication, construction, commissioning and handover, through to plant operations and maintenance
- Informing and including all project participants (i.e. client, project partners, engineering contractor, suppliers, construction contractors, and the operator) in the IM planning process, to take full advantage of information sharing and re-use
- Implementing IM by proven project management principles based on a clear strategy and detailed plans to manage resources, cost and schedule
- Employing proven methods in IM to best advantage
- Taking advantage of emerging IM methods where the rewards to the client and project are beneficial and the risks are understood and manageable

- Creating information once, and capturing, sharing and re-using this during project execution and throughout the life cycle
- Holding information once only as a master reference, and making it accessible to all. This should be pursued to the maximum extent practicable, particularly between the core project participants
- Sharing, rather than exchanging, information between the core participants to the project to the maximum extent practicable
- Enabling users to extract the information they require, when required, in the required format. This is in contrast to the situation where the generator of the information distributes this with no concern for its eventual use. In particular, users need to be able to select specific information easily without having to accept large amounts of unnecessary additional data and documents
- Recognising information has value, and building on this in subsequent activities in a value-adding process
- Providing access for input, review, and retrieval of information through familiar interfaces wherever possible
- Using IM as a key means to manage the quality of information, in particular its correctness, consistency and completeness
- Using IM as the key means to manage configuration and versions, along with the control of approvals to new and changed information
- Integrating the information with the management of workflow, linked to organisational responsibilities

The application of any of the principles provided in this document must be based on an assessment of the payback available from the benefits foreseen.

2 Background

2.1 Facilities Information Requirements

All assets move through a life cycle, typically shown in Figure 2.1. Asset information is created at all phases of this life cycle, particularly during design, and is of use throughout all subsequent phases. There are many groups which create information and which need ready access to it. Information sharing between groups is vital.

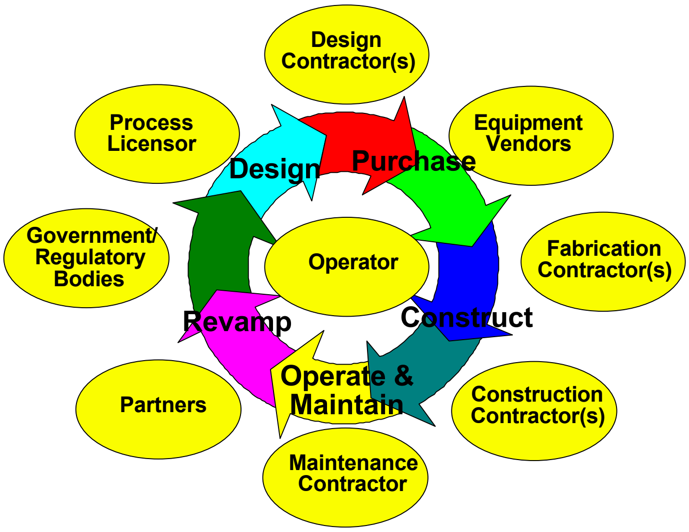


Figure 2.1
Asset Life cycle

2.2 Current Issues

Information comes from many sources and may be in a variety of formats, from paper through to intelligent schematic diagrams and 3D models produced by CAD systems. The owner/operator needs to manage this information throughout the life cycle, but the variety of formats, terminology and conventions makes this difficult. Despite most information being created in computer systems, delivery is often on paper. Even when computer files are handed over, they are often without the attached intelligence and hence only in the form of "electronic paper".

The management of electronic files and scanned images from paper has relied on electronic document management systems (EDMS). These systems have their own problems, in particular the need manually to reference, index and cross-reference documents. Even when newer technologies such as "free text retrieval" can be used to parse files, storing information as documents does not address issues of quality (i.e. completeness, consistency and correctness). Furthermore, the variety of terminology and conventions employed leads to confusion and misinterpretation of data.

The costs of managing facilities information are considerable. Handing over information, sorting it, and inputting it to the operations and maintenance systems, can cost 3-5% of the capital cost of a project. Once the asset is in operation, engineers can spend between 10% and 30% of their time searching for and validating information. When a plant revamp is carried out, a complete site survey and re-draw is often necessary because the information has not been maintained.

2.3 Potential Solutions

The key to improved management of asset information is to move from the management of documents to the management of information. In the document management world, information is buried in individual documents and a particular item (e.g. a pump) may be referenced by multiple documents. In the information management world, all information about the item is stored in a database in one place and documents are created as and when required from this information.

By compiling information from the various sources into an information warehouse, the information can be integrated into an intelligent data store which represents a model of the asset. Standards such as STEP (ISO 10303) and POSC/Caesar (ISO 15926) provide a common format, terminology and conventions. A standards-based warehouse enables sharing of information in an environment where partnering, alliances and concurrent engineering are increasingly important.

The use of a data warehouse as a single repository for all asset information, effectively representing a unified "model" of the asset, is described in Appendix A to this Attachment. Note however that the use of a single repository of information does not necessitate that all project information be held in a single physical location during execution, as the repository itself can be distributed among the project participants. Examples of outline functional specifications for data warehouses are available from the Epistle website at www.stepcom.ncl.ac.uk.

2.4 Further benefits

Once information is stored in an intelligent format, further benefits may be realised enabled, including:

- storing information in an intelligent format enables its quality to be more easily monitored and controlled
- information management can be extended to cover management of configuration and versions
- the information can be integrated with workflow management, ensuring faster, more accurate and more auditable activities such as change management, review processes, etc.
- standardised information enables improved cross-asset comparison, for example for life cycle costing, reliability, etc.

- standardised information separates the information from the software systems, making it easier to change system, integrate different systems and to co-operate with partners who use different software. It allows us to select "best of breed" information systems and to start treating information management as a commodity rather than a specialisation
- intelligent information can more easily be integrated with other business information held in other systems

2.5 Culture Change

Technical developments in IM systems in recent years have opened up opportunities to reduce project costs. However, to achieve the full benefits which are now available there also needs to be change in the culture and approach of the project teams.

In particular a more integrated approach to project execution is needed. The achievement of a wholly integrated project approach is dependant on the ability fundamentally to challenge the behaviour and practices carried from project to project, and on the adoption of a policy of openness by all parties.

There must be a willingness to engender a spirit of co-operation from the outset and maintain that spirit at all times, with no retreat to entrenched positions at the first sign of trouble - a *team* effort in all senses.

The team should comprise members from all main project participants and, be brought together at the earliest possible opportunity regardless of the of the contract style (alliance, lump Sum, etc.). This will provide the opportunity to determine the requirements for successful project execution, particularly in relation to IM where early, consultative decisions can result in significant benefits at later project stages.

2.6 Open Approach

The goal of an integrated project depends on open and honest relationships. One of the key elements to successful project execution is the availability of shared, consistent information, without the necessity for duplication of effort by two or more of the participants.

This will inevitably require permission for "outside" access to previously protected systems and data, a significant change of culture in its own right. While security and information release status measures must be addressed, the aim must be the use of consistent information by all parties (for example, *one* all-purpose 3D model and materials database).

3 Client IM Policy

The operational life of a facility is many times longer than the engineering, procurement and construction period. Also much of the information generated during the project is required for use during the subsequent life cycle phases of the facility. As a consequence of both of these aspects, a project IM strategy should be developed within the framework of an overall client IM policy.

The IM policy should be generated and owned by the client, and established before the external participants to the project are mobilised. In certain circumstances however the client may require the assistance of the engineering contractor in developing his requirements, in which case it should be one of the earliest project activities. The policy should address the following, and largely in the order shown:

- The business needs
- The operational and maintenance needs
- Information handover
- The project execution needs
- Information provided to the project

These topics are shown diagrammatically in Figure 3.1, and described in further detail in the following sections.

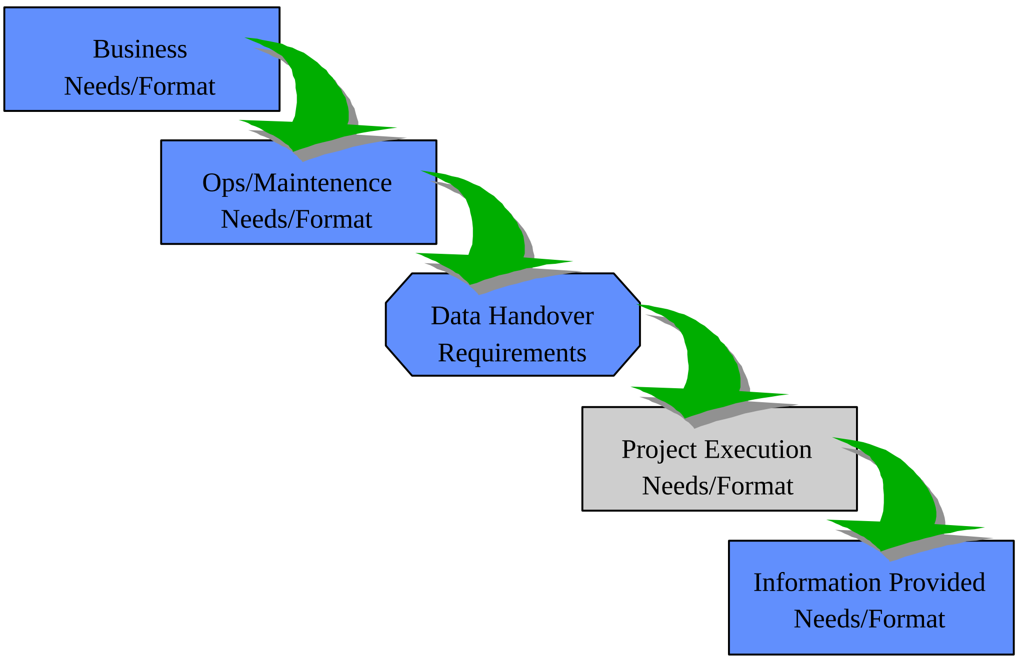


Figure 3.1 Information management policy

3.1 Business Needs

The first consideration is to define the business information required corporately to operate the facility, and the format which the information is required in to interface with corporate systems. This assessment should be done in conjunction with the ultimate owner of the facility, where the owner is not the project team. From this, an assessment should be made of the business information which is required to be delivered from the operational systems.

3.2 Operational and Maintenance Needs

As a subset of the business needs the information required to operate and maintain the facility should be established, again including the format of that information. This assessment must involve the operator of the facility, and include for generation and provision of the business information needs, as established in 3.1 above.

Having defined the operational and maintenance needs, the information to be handed over from the project execution stage should be determined. Before doing this, this a careful assessment should be made of the extent of information required to be held in the operational and maintenance systems.

To assist in this assessment, project information should be given a life cycle code which reflects the value of each category of information, and identifies whether the information is frozen or is required to be kept live. Attention should be focused on that information required to be accessed regularly, or urgently in times of upset or emergency. As a first step, consideration should be given to storing other information off-line. Ultimately an assessment should be made of the extent of information which can be left with the originating contractor or supplier to archive, with appropriate mechanisms to retrieve on an as-required basis.

The end-user must be able to utilise the transferred documentation in the proposed electronic formats. It should not be assumed that the client has, or will be able to justify purchase of all relevant information technology (IT) systems to provide for seamless electronic data transfer.

3.3 Information Handover

The requirements for the handover of information from the project should be fully defined with respect to extent, format, timing, and responsibilities. Reference should be made to the "Data Handover Guide" being prepared under the PISTEP initiative, an Executive Summary to which is included in Appendix B to this Attachment.

The definition of the information handover requirements is of paramount importance to the establishment of an effective Project IM Strategy, and should be addressed in the front-end phase of the project, alongside definition of the actual plant which the project is to provide.

The definition of the handover requirements should be included in the Invitation to Bid (ITB) sent out to prospective engineering contractors.

3.4 Project Execution Needs

Having defined the information required to be handed over from the project, both in terms of content and format, the policy should define the information requirements during the execution of the project. Considerations should include the information the client wishes to review and approve during execution, and the locations of client participants. The policy should also address how activities such as review/approve/change are to be managed, and how work flow management, version management, and configuration management are to be implemented.

Care should be taken to minimise information flow to the actual information necessary for effective management of the project. Care should also be taken to specify only the *extent* of information required during execution, and as necessary the required format of the information. The client should avoid dictating the actual systems to be used in execution, as this can lead not only to the introduction of unnecessary costs, but in the extreme to the elimination of potential contractors and suppliers.

As with the information handover requirements above, definition of execution requirements is critical to the establishment of an effective Project IM Strategy, and should be addressed in the front-end phase of the project. The definition of the execution requirements should again be included in the ITB to prospective engineering contractors.

3.5 Information to be Provided to the Project

The final consideration for the IM policy should be the extent and format of information to be provided to the project. This must start with an assessment of the information which is available, and of the format it is in. In certain cases this may place a constraint on the subsequent IM Strategy, particularly for revamps and extensions to existing facilities. For any project this information will be added to by that prepared prior to award of the engineering contract. The IM requirements should be developed sufficiently early in order that this information can be developed in a form which is consistent with the overall policy for the project, and defined as such in the ITB to prospective contractors.

Having developed an information policy in accordance with these guidelines, a functional specification should be in place from which the Project IM Strategy can be developed, and which will fit within the overall life cycle information plan established for the facility. The development of such a Project IM Strategy, which must be done by the main participants to the project in conjunction with the client, is described below.

4 Project IM Strategy

4.1 General

The Project IM Strategy should be developed to address the twin aims of delivering the client's information needs in accordance with the established IM policy, and of applying effective management of information during project execution to enhance significantly the efficiency of execution. On both accounts the objective must be to achieve substantial reduction in the project and life cycle costs of the facility.

In the first instance the Project IM Strategy should be driven by the client's IM needs and ambitions as defined in the ITB. It is important the engineering contractor understands not only the client's IM requirements, but also why they are needed. A clear perception of the client's vision for plant information needs will assist the engineering contractor to respond fully and realistically to these needs at minimum cost. Additionally ,this understanding of client vision will enable the engineering contractor to draw on experience to offer proven solutions and credible alternatives where these are more suitable and/or cost effective. An essential element of this approach is to plan for the collection of handover information from the start of the project.

Having addressed the requirements of the client's IM policy, the Project IM Strategy needs to be developed to maximise the efficiency of project execution for all main participants.

It is important that IM systems are fully operational at the commencement of the project. It is impractical and inadvisable to develop a system in parallel with the project.

4.2 Project IM Strategy

In the response to bid, a draft of the Project IM Strategy should be defined by the engineering contractor. The IM Strategy at this stage should define how information will be managed during the project to achieve most cost effective execution while delivering the client objectives. The former should be addressed by applying the information management principles identified in 1.2 above. The latter should be driven from the key elements of the client's IM policy.

Consideration should also be given to whether existing electronic information is available and suitable for reuse. In the case of refurbishments and extensions to existing facilities this may comprise information from the original project. For any project an assessment should also be made of whether information from previous similar projects executed by the client or the engineering contractor can be reused. In either case substantial economies of execution can be gained if the need to re-generate the same information can be avoided.

Before inclusion in the bid response, the draft IM Strategy should be circulated to the engineering contractor's departmental managers both to gain their acceptance and to ensure all opportunities to maximise the efficiency of execution have been captured.

4.3 Key Areas of IM Strategy

The IM Strategy in the contractor's bid response should address the following key elements:

- Reaffirm or reference client IM requirements
  - Client's business objectives
  - Plant operational requirements
  - Handover needs
  - Client needs during project execution
  - Client input information to project

- Client input information
  - Scope, structures and format of input information to project
  - Method of delivery to project
  - Storage and method of access by project participants

- Handover requirements
  - Plant operations and maintenance requirements for information
  - Scope of information handover requirements
  - Business value of information (life cycle code)
  - Specific databases and extent of information
  - Structures, codes and format requirements of information handover
  - Engineering status of information at handover
  - Mechanisms for collection of information
  - Method and schedule for handover

- Client requirements during project execution
  - Client IM representative/organisation,
  - Client team locations, infrastructure and IM tools requirements
  - Information flow mechanism for comment and approval
  - Formal reporting cost control
  - Training needs

- Project execution team requirements
  - Project office(s) infrastructure and desktop standards
  - Site infrastructure and desktop standards
  - Policy for on-line documents

- Execution IM strategy, IM tools and data
  - Engineering IM strategy
  - Procurement IM strategy
  - Construction IM strategy
  - Project control IM strategy
  - Document control IM strategy
  - Supplier/fabricator IM strategy

- IM mobilisation schedule, critical milestones and approvals

- Management of IM budget and approvals

- Project IM organisation, resourcing and IM support

- Data management, access control and security

- Project coding and standards

- Project IM training needs

- Wide area communications
  - Locations of project team, key suppliers, fabricators and site
  - communications standards and protocols
  - E-mail interchange
  - Internet usage
  - Sharing and exchange of information

- Version and configuration management

- Integration of information from many sources into a common "model"

- Tools to be used to generate information (CAD, databases, etc.)

After project award the Project IM Strategy should be developed further to ensure it remains an integral part of the project execution strategy. Under the overall ownership of the engineering contractor the strategy should be developed initially by the engineering contractor and client into detailed plans and procedures for implementation. Care should continue to be taken to ensure these plans and procedures address the means by which the improvement in efficiency and reduction in costs are to be achieved.

As soon as practical the strategy must be further developed to cover the participation and needs of key suppliers and construction contractors. Evidence suggests that the capabilities of companies along the supply chain to distribute and receive information electronically is under-utilised, and that significant benefits remain to be captured in this area. Of necessity some of these parts of the IM Strategy may be developed initially in preliminary form and confirmed after the key participants join the project.

5 Information Management Tools

5.1 Introduction

Many of the systems currently in use in project execution are already providing significant operational benefits in the individual phases of the plant life cycle. However there are significant opportunities for further development through integration across operational boundaries both within and between participants.

The objective must be to develop integrated tools that provide all parties with a seamless electronic flow and visibility of information on a need to know basis. This development will be assisted by industry, national and international co-operation and agreement on the use of suitable standards such as ISO 10303 (also known as STEP, the STandard for Exchange of Product Data) and POSC/Caesar (now recognised as ISO 15926), through participation in initiatives such as PI-STEP, EPISTLE and POSC/CAESER.

Systems should be selected on an appropriate basis. Systems which are appropriate for a £200M greenfield facility may well be inappropriate for a £20M retrofit.

5.2 Office Automation

Office automation tools within the project environment include:

- Word Processing for contractual documents, correspondence and reports
- Spread sheets and databases for the collection and tabulation of cost, scheduling and resource data
- Email systems for electronic correspondence and the transmittal of electronic attachments

The functionality of the leading commercial systems is broadly similar. A major consideration in selecting software and its specific development within a company must be the ability to transfer information to and from other systems, and the commitment of the provider for the system to continue to be developed on a regular basis.

Email systems in particular must be able to interface electronically with and accept information from all the other primary Email and office systems used around the world.

5.3 Engineering

5.3.1 Intelligent Schematics and Engineering Databases

The addition of database tools to established 2D graphics packages provides considerable potential for ensuring consistency of graphical and process design information. Significant benefits will only accrue however if the value of the data is fully utilised downstream. The application of such systems needs to be carefully assessed against the perceived benefits.

A similar assessment should be made of the potential and benefits of utilising instrument and equipment databases.

5.3.2 Electronic Modelling

Use of a 3D electronic model with attached database is now common in the execution of major projects in the industry. Benefits of shorter engineering schedules and accurate, constructable and clash free designs have been identified.

There is considerable scope for further utilisation of the model information in construction and commissioning, and for sharing of the model information with suppliers, fabricators, and construction contractors. Benefits should be pursued from the transfer of the 3D model to structural steel fabricators, such that the information can be utilised to produce fabrication details and production schedules. Similarly significant savings can be achieved by joint development of the model with piping fabricators and the subsequent extraction of design deliverables which can be directly used for shop floor spool fabrication.

5.4 Procurement and Materials Management

The procurement and materials management functions on a project utilise large quantities of data, which must be processed, manipulated and presented in various forms to suit the needs of the project. IM systems are ideally suited to these tasks and should be fully utilised.

The procurement system should record and detail the status of all enquiries and orders on the project. The system should be integrated with the planning and cost control systems to ensure that the appropriate data is shared.

The materials management system should be robust and reliable, and should be used to ensure that receipt, management, scheduling and issue of materials is fully controlled. The system should also be used to trend bulk quantities and manage overages.

Benefits are available from close integration of the procurement and materials management systems with the 3D model to automate material take-offs and to track the progress of procurement against the model of the plant.

5.5 Construction

The 3D model and associated database should be used extensively in construction. Significant benefits can be achieved through:

- 3D visualisation of the plant
- Model review for constructability and accessibility
- Substantial reduction in the volume of paperwork
- Integration with the construction contractor's systems, and the ability to extract the information required in the format required by the contractor's workforce, e.g. creation of piping isometrics to suit the manufacture of pipe spools.
- Extraction of 3D perspectives for visualisation at the workface
- Reduction in construction rework by instant change notification from the engineering contractor
- Efficient materials management and material allocation (particularly where the procurement material management systems are integrated with 3D model)
- Visual progress indication (particularly where the 3D model is integrated with the project planning systems)
- Rapid and efficient update of design to incorporate construction changes and as-built information

5.6 Project Control

The selection of planning and cost control systems should be based upon both the size of the project and the level of detail required. Efforts to interface the cost and planning systems with other project systems should be addressed as they are likely to offer significant payback Particular areas for integration include the 3D model, to aid visualisation of the construction process and quantification of the construction workscope, and the procurement and materials management systems so that the plan can be maintained with actual information from the procurement process.

Effort must also be directed toward integrating plans between the major project participants, and across at least the immediate neighbours in the supply chain. Consideration should also be given therefore to the facility to share and exchange planning and progressing information between project participants.

Estimating relies heavily on the availability of supplier information for inclusion in estimating databases and cost estimates. At present comparatively little manufacturers' information in the form of catalogues, specifications and price lists is available in electronic format. Electronic availability of this information should be encouraged as it will substantially reduce the cost and duration of estimate production, assist in the evaluation of value engineering "what if" scenarios, and help to encourage clients and engineering contractors to use both standard equipment items and particular manufacturers' equipment.

5.7 Commissioning Systems

Activities involved with the commissioning of process plants require large amounts of information from the design and procurement phases. Tracking the status of completions is also a vital aspect of planning and performing commissioning activities in an efficient manner.

The use of commissioning tracking systems to track progress of completions (typically on the basis of completions systems) and to record commissioning tests and results can greatly assist this complex activity. Efficiency can be improved if links to design, procurement and project planning systems allow the completions database to be built up automatically.

5.8 Data Warehouse

Due to the amount of sharing required between the different aspects of the project, consideration should be given to using a data warehouse which serves as the central repository of all project information, to be accessed by all systems and project participants. The warehouse represents a single “model” of the asset under construction.

In addition to maintaining consistency of information across the project and across organisations, the warehouse can be used for quality, version and configuration management for the whole project in a consistent way. Integration of the information with management of the workflow is enabled by the use of a data warehouse. he warehouse can be the main means to handover information from the project to the operator.

5.9 Document Management

The use of an electronic index to identify all project documents and their status is well established. Additionally the index should either contain planned, forecast and actual issue dates against all documents, or provide a link to the planning system. This is the recommended minimum practice. On-line access to this information should be available to all project participants as appropriate, rather than paper distribution of the information.

Newer systems generically termed electronic document management systems (EDMS) should be considered for storage and on-line access to document source files and/or viewable renditions. The EDMS approach also enables the implementation of electronic workflow to replace paper based distribution and review/approval. The use of an EDMS can have significant benefits in execution efficiency and may also assist in the accumulation of handover information in electronic format.

It is important to recognise that document management is only a part of the overall information management, and that further opportunities can derive from linking the EDMS to the data warehouse. Use of intelligent document formats (e.g. Active CGM and STEP Part 42 notation) and techniques such as Free Text Retrieval (FTR) enable links to be created and stored between objects in the warehouse and their graphical representation.

6 Infrastructure

6.1 Introduction

This section provides guidelines on establishing the computer hardware, software, networks and communication systems needed to input, manage and deliver project information effectively. It is assumed the use of computer systems is already established as part of working methodologies.

These guidelines exclude plant operating and control systems.

6.2 Inter Office Communications

For an effective IM Strategy to be implemented facilities must be established for the exchange and sharing of information between project locations. Locations where electronic information exchange and sharing is required should first be established, including:

- Client offices
- Engineering contractor's offices
- Process licensor's office
- Consultants' offices
- Major suppliers' or fabricators' offices
- Construction site

Communications issues across these locations should then be addressed as follows:

- Establish the volume, format and frequency of information flow to size the bandwidth requirements
- Determine the network management requirements, whether a dedicated project network managed independently, or by in-house personnel
- Identify any security issues arising out of the interconnection of networks
- Optimise communications by use of existing or new leased land or sea cables, existing or new satellite or microwave technology, existing or new ISDN or Internet, dedicated or dial-up links
- Check costs and delivery time, especially for overseas installations
- Check whether the client already has part of the proposed network in place
- Determine the demarcation of costs between client and engineering contractor for example, who pays for leased lines, who pays for connections to LAN, duration of contracts, depreciation of hardware, security, reliability, availability of services, logistics, connection to local or national telecommunication systems, costs of disinvestment of equipment and ownership at project close out
- Establish telecoms providers recovery plan in case of communications failure
- Produce a diagram showing the project wide area network, and on a separate diagram show the type of information, including all data, video conferencing and voice traffic requirements, that needs to be managed between the various project locations
- Produce a schedule for implementation of these facilities

6.3 Engineering Contractor's Office

There may be a number execution centres, where all or most of the following guidelines need to be addressed:

6.3.1 Software

Requirements need to match the project execution plan. Hardware, network and communications requirements will generally be dictated by software requirements.

- Determine which business, engineering, material and document management systems are to be used
- Establish what helpdesk facilities are needed
- Establish project data management requirements for centralised storage and for any special interfaces, Intranet, middleware, or testing/validation facilities for new applications
- Establish procedures and standards for IM operation, including electronic handover and archiving
- Establish backup, recovery and security plans

6.3.2 Hardware

- Establish whether client/server technology is required
- Establish standard specifications for desktop client and server equipment
- Establish standard specifications for plotter/printer/fax/scanning equipment
- Produce histograms against project schedule of PC/workstation/server requirements
- Produce a project upgrade plan for hardware, network, software version control and communications

6.3.3 Network

- Establish whether one or a number of project Local Area Networks (LAN) need to be established. Consider whether a separate LAN is required for resident client personnel
- Establish the network and operating systems for project applications
- Establish whether the network is going to be set up and managed as an out-sourced contract or by in-house expertise
- Produce a diagram showing the main execution office project local area network

6.3.4 Communications

- Establish compatible email system
- Establish telephone/video conferencing needs and expected volume of traffic

6.4 Fabrication and Construction Sites

Fabrication and construction sites may be in remote locations, hence established communication links may not be in place. Many of the guidelines outlined above are also relevant to construction site installations.

6.4.1 Software

- Determine which project control, materials and document management systems are to be used.
- Establish time control, records, and payment systems.
- Establish use of 3D CAD visualisation requirements.
- Establish whether design data can be used directly for site fabrication.

6.4.2 Hardware

- Establish the mobilisation program of construction staff.
- Establish the availability of skilled IT resource, and local support.

- Establish the strategy for the configuration and shipment of hardware from client, engineering contractor, or construction contractor home office or local.
- Arrange transportation, import and custom duties on hardware and software.

6.4.3 Network

- Establish the construction site LAN requirement (Main office, warehouse, accommodation, etc.)
- Establish the integration of construction phase requirements with final plant operations network.
- Establish whether the network is going to be set up and managed as an out-sourced contract or by in-house expertise.
- Produce a diagram showing the construction site network.

6.4.4 Communications

- Establish the strategy for external communications links, use of satellite phones, use of land-based satellite stations, use of mobile phones on-site.
- Establish connections to local telephone exchange.
- Identify the volume and type of information to exchanged.
- Establish whether site need on-line access to home office data or batch transfer.

7 Organisation and Resourcing

7.1 General

In order to maximise the benefits available from effective information management, the project requires to be carefully organised to ensure that the required IM systems are available for use, and are fully utilised. This extends to the provision of suitable infrastructure, both hardware and software, and personnel with the appropriate knowledge and expertise required for the systems.

7.2 Integrated Project Organisation

Many projects are now being carried out on an integrated basis, with combined client, contractor, and sometimes supplier teams. In this case, the role of the specialist co-ordinators in the companies should be taken by one person, with support from the IT departments of the relevant companies as appropriate.

The project implementation team should be given sole responsibility for all IM activities associated with the project. This provides a clear focus for IM and ensures that the project can proceed with its main aim of building the plant on schedule and within budget.

To achieve this, the project team should include a dedicated IM specialist. This specialist will be responsible for setting the strategic requirements for IM, and for ensuring that all aspects of the IM policy are applied to the project. The specialist will take a leading role, in ensuring that IM is appropriately utilised on the project. In many cases the role of the co-ordinator will be a full time requirement during the early months of project start up and setting systems into place, after which involvement may be on part time basis.

Where a project is of insufficient size to warrant a full time specialist, this role may be assigned to a company specialist on a part time basis. Alternatively, one member of the project team can be assigned this responsibility and supported by the IM organisation as required.

The work carried out by the project implementation will generally involve a number of different IM systems, which will be used by different specialist members of the team. One person within the project shall be assigned overall responsibility for the implementation and use of IM systems. This IM co-ordinator must be mobilised as early as possible in the project schedule, and should report direct to the project manager. He should be responsible for ensuring that the IM Strategy is developed in accordance with these guidelines, that all systems are correctly implemented, and that the interfaces between systems are properly managed.

The Project IM co-ordinator should ensure that the strategic direction and the implementation of IM on the project is followed. An additional responsibility of the IM co-ordinator should be liaison with supplier and construction contractor specialists to ensure their understanding of the project requirements on IM, to incorporate their information needs and deliverables into the Project IM Strategy, and to ensure that they are correctly implemented.

The IM co-ordinator should be responsible for co-ordinating the support of specialists in the engineering contractor's IT department to ensure that the project receives the required internal support. The Co-ordinator should also be responsible for ensuring that infrastructure and systems are provided to the required plan.

7.3 Suppliers Organisation

Supplier companies will adopt different approaches to organising IM systems, depending on their size, the complexity of their product, and the type of company which they sell to. It is not possible to give specific guidelines on the best approach which they should adopt. There should, however, be a specific point of contact between the relevant specialist in the supplier organisation and the project IM co-ordinator.

8 Training

Client, contractor and supplier companies invest substantial sums of money in IM systems, with the aim of reducing overall project costs.

The provision of training to members of the project team must be addressed to ensure that a payback on the investment is realised. Training of personnel can realise substantial benefits, as the opportunities provided by the systems can be fully developed. It should be noted that training costs are relatively low in comparison to infrastructure provision and support costs, and will generally have a significant payback.

There are two main aspects to training; training in the use of specific systems (such as CAD) and general awareness of the project objectives in IM. Generally, effort is put in to the specific system training but there is an increasing realisation and acceptance that all project members need to understand what the objectives of the IM strategy are. This is particularly true where the project is attempting to achieve significant performance improvement by using high levels of integration, for example using a data warehouse.

Project members need to understand the following:

- the quality objectives and requirements for information
- the need for consistency across all project groups and disciplines
- the advantages from creating information once and using it many times through sharing
- the project objectives in handing over information to the client
- the fact that information they create for a specific purpose (e.g. procurement) may have a further use in the life cycle (e.g. for maintenance)
- people may need to create and store information that is not of direct use to themselves but is of use to others later on in the life cycle
- the need to adhere to agreed and defined formats and conventions

The personnel assigned to a project should have a working knowledge of the IM systems appropriate to their technology or discipline. It is likely that in many cases, refresher or job specific training will be of considerable benefit. The extent and duration of this should be established at commencement of the project, and a training plan and budget should be prepared. Training and familiarisation programmes should be established to cover any new systems and significant upgrades, and to disseminate the strategy for the effective application of IM on the project.

An important area in developing the full benefit of IM is to use the systems across discipline boundaries. A useful technique for exploring opportunities is the use of "workshop" techniques, where personnel can spend concentrated time, often away from the workplace, looking at ways to implement the systems across the project.

If the project is the first use of a system (or a significant upgrade of the system) by the contractor then there is a significant risk of teething problems and a strategy for personnel training and problem solving needs to be in place.

APPENDIX A

LIFE CYCLE MANAGEMENT OF INFORMATION

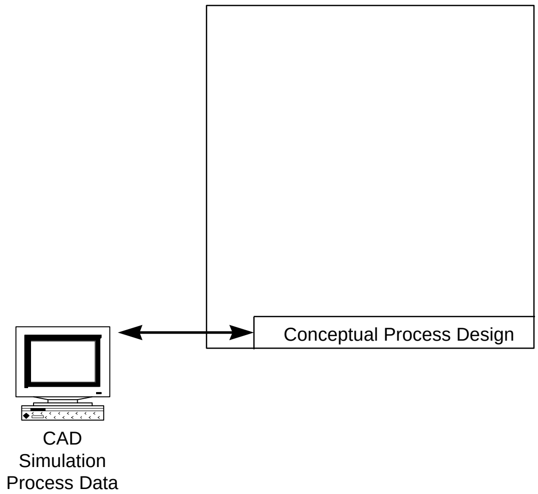
It is important to manage process plant engineering information throughout the life cycle of a process plant. The key elements of good information management are:

information is created once and used many times
information is held in one place and one place only
information is accessible to all who need it

This document presents a model approach to managing the information throughout the life cycle.

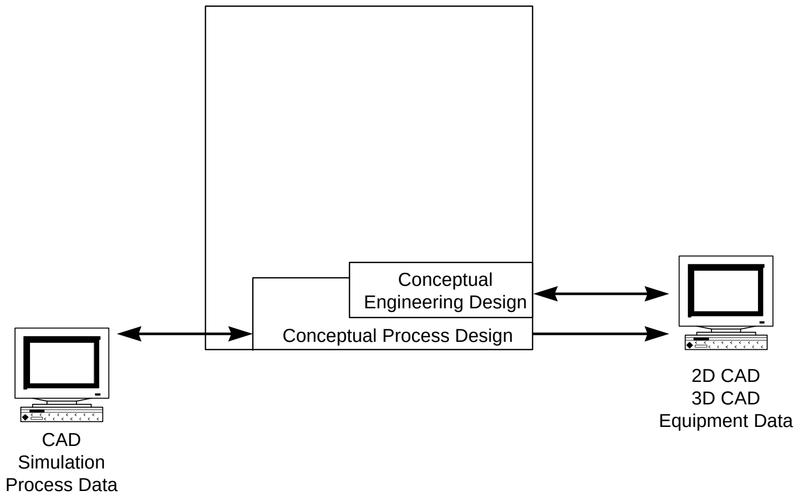
At the outset of the process plant life cycle no information will exist.

However, as soon as conceptual design starts, information will begin to be created. This will typically comprise various design cases and business scenarios. High level process simulations of the different cases may be created and stored to be compared against various marketing and feedstock scenarios. Preliminary flow diagrams and process data will also be created.



The conceptual design team will use various tools and will need to share the information that they created.

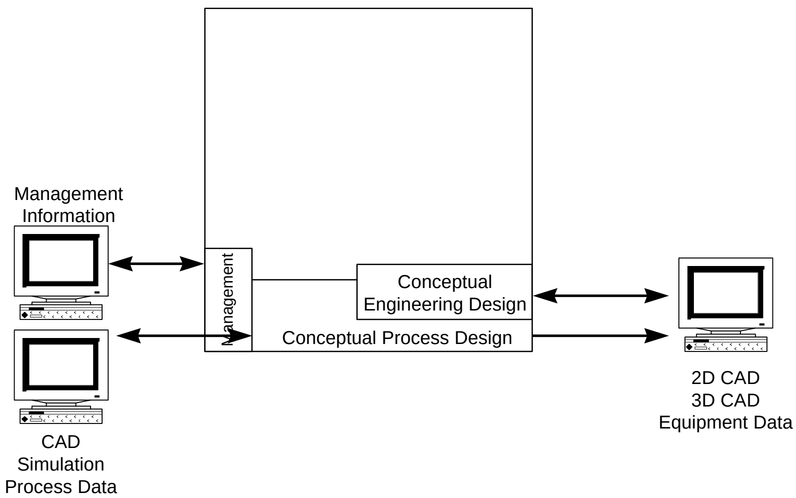
Storing the information in a central repository not only enables sharing but also forms the basis for the information management throughout the life cycle.

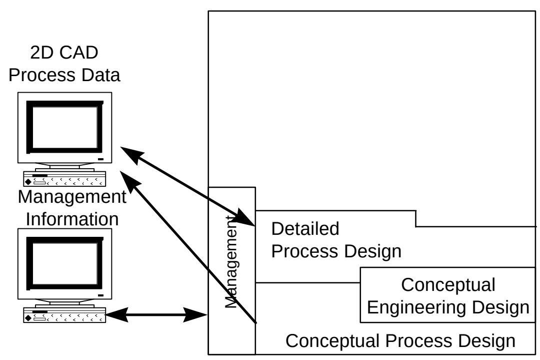


As the project progresses, conceptual engineering design information is created, using much of the conceptual process information that has been created. These activities will continue in parallel, building up an increasing level of detail, eliminating options and arriving at the key design parameters.

In parallel with the development of the design, management activities will also begin to create information which is relevant to the whole project.

This management information is related to much of the design information (e.g. costs, schedule and organisational responsibilities are all associated with each part of the process plant). Therefore, this information should be part of the overall plant information repository.

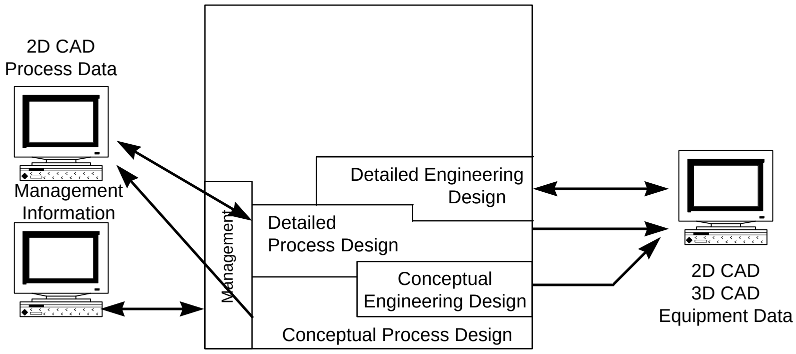


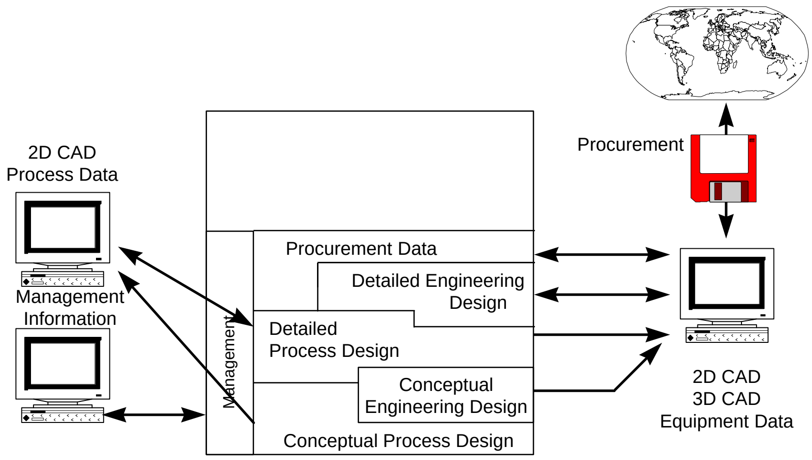


As the project moves into detailed design, the design team will use the conceptual process information to develop the detailed process design. Typically, the design team will use tools such as 2D CAD to develop the P&I diagrams, which will be added to the total information being collected for the asset.

The detailed engineering information will be built up based on the detailed process design and the conceptual design information using 2D and 3D CAD tools.

This information is stored in the repository so that it can be shared amongst the design team.





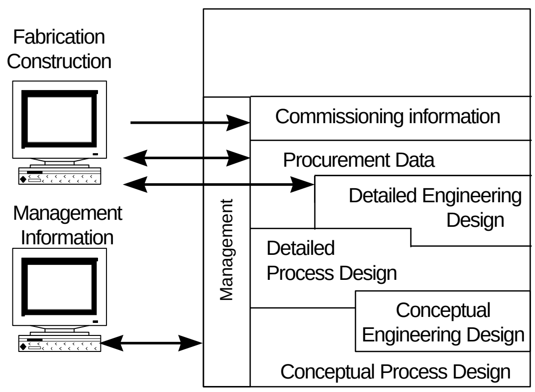
Procurement data will start to come in to the project as the result of the design team sending out enquiries and receiving information.

This information will also be added to the repository so that it is accessible to the entire team.

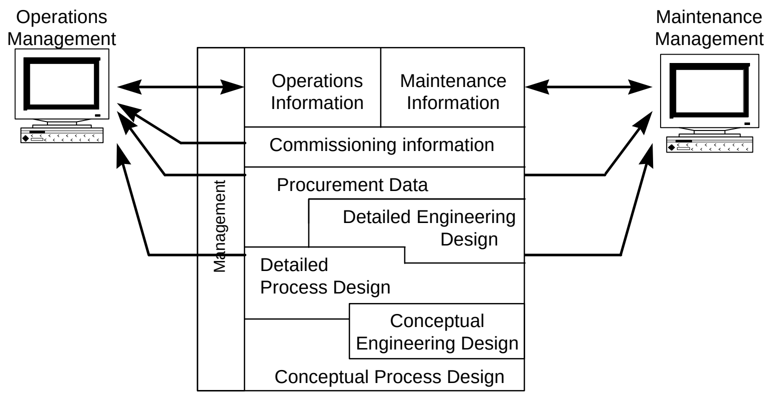
The design and procurement information will be critical to the fabrication and construction phases. The fabrication and construction contractors will require ready access to the design information in order to create their own drawings to support their activities.

At this stage, “as fitted” updates will be made to the design information based on actual fabrication and construction.

Information on completions will help the project manage the transition into the commissioning



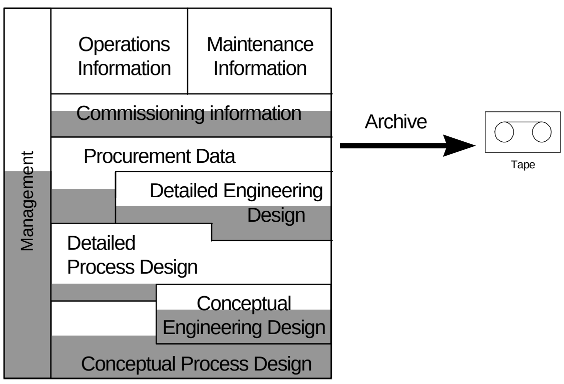
phase. The results of testing and information from commissioning will also be gathered and stored in the repository.

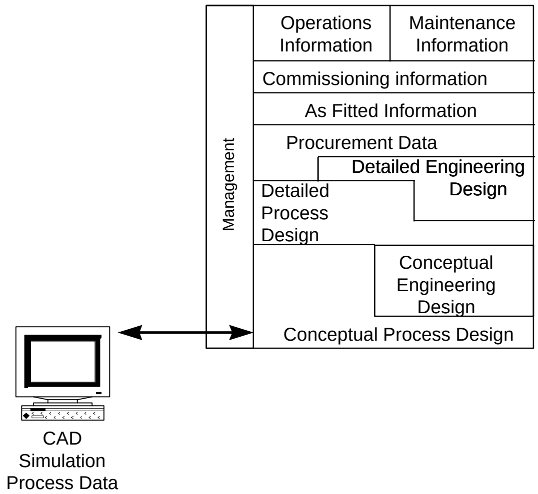


After commissioning, the plant will move into the operations phase. The information created during the project support the operations' and maintenance activities by providing the basic plant reference data. However, additional information concerning operations and maintenance activities will also start to accumulate, such as reliability information, work orders and plant performance data.

Much of the information created during the project may be transitory and not relevant to the day-to-day operation of the plant. Some of this data may be required for legal reasons, but nevertheless, it is not required on-line.

Therefore, at some time, it is likely that certain data will be selected and archived off to long term storage such as tape or optical disks.





The life cycle comes ‘full circle’ when some form of plant revamp starts with conceptual design. The accumulated design information forms the starting point for the new design.

APPENDIX B

PROCESS INDUSTRIES DATA HANDOVER GUIDE

EXECUTIVE SUMMARY

The Process Industries Data Handover Guide is intended to assist users to develop a suitable information handover strategy for process plant engineering projects.

Information created during an engineering project is of value for subsequent life cycle stages of the process plant, in particular for operations, maintenance and engineering. The handover strategy must be based on the business requirements for the future use of this information.

The process for handing over information from the project to the operator consists of four main stages, each of which is addressed in the Guide:

- Establishing a policy for handover
- Determining the business requirements for information to be handed over, including:
    - the information is required
    - the format for the information
    - how the information is to be used
    - how the information will be stored
    - the reusability and retention of the information
    - quality of the information
- Developing a handover plan, which forms part of the overall project information strategy, to include:
    - methods of data handover
    - responsibilities
    - timing
    - media for handover
    - quality management
- Implementing the handover, which requires:
    - educating the staff
    - checking for compliance against the policy and plan

Developments in the methods for managing engineering information have resulted in the potential to greatly improve handover of information, particularly in relation to its reusability and its quality assurance. The Guide covers developments, for example new ISO standards, which greatly enable this process.

ACTIVE VALUE ENHANCING PRACTICE

No. 1.7 PROCUREMENT STRATEGY

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ACTIVE VALUE ENHANCING PRACTICE

No. 1.7 PROCUREMENT STRATEGY

Purpose and Benefit

The development of appropriate procurement strategies at an early stage of a project can have a significant impact on the project outcome by enabling effective supply relationships to be developed and by ensuring value is added at all levels of the supply chain.

Essential Activities

The essential activities for the preparation and definition of effective procurement strategies are described under the following headings:

- Elements of a procurement strategy
- Strategy for tendering and communications
- Dealing with intellectual property issues
- Strategy for post-tender negotiation
- Measuring the value of the procurement process

Guidelines for Implementation

1.7.1 Guidelines for Determining Elements of a Procurement Strategy

Procurement strategies should be appropriate to the value and criticality of the goods or services to be procured, and should:

- Be consistent with the overall business and project goals
- Clearly define the objectives of the procurement process
- Set out the market approach and decision making criteria
- Define the process for risk apportionment and management
- Be agreed and implemented throughout the buyer's organisation

Procurement is the process of acquiring goods and/or services from another company or organisation. It is an important business process in any project and a key value driver both in reducing costs and encouraging innovative solutions through co-operative relationships. As with any business process, developing and implementing an effective strategy at an early stage is critical to a successful outcome.

A procurement strategy should be written within the overall context of the business principles by which a company operates. These may be set down explicitly or may be part of the culture of the organisation, and will typically include principles relating to business ethics, security and fraud control, and safety, health and environmental requirements. The strategy, if it is to be effective in adding value to a project, must be aligned with the overall business or project strategy. Indeed, the overall procurement strategy for a project should be an integral part of the project strategy itself. It is only by early involvement of the procurement function that maximum value from the procurement process can be realised. The nature and complexity of the strategy for procuring goods or services will depend on the criticality and expenditure involved.

The nature and complexity of the strategy for procuring particular goods or services will depend on the criticality and expenditure involved. It will typically include the following key elements:

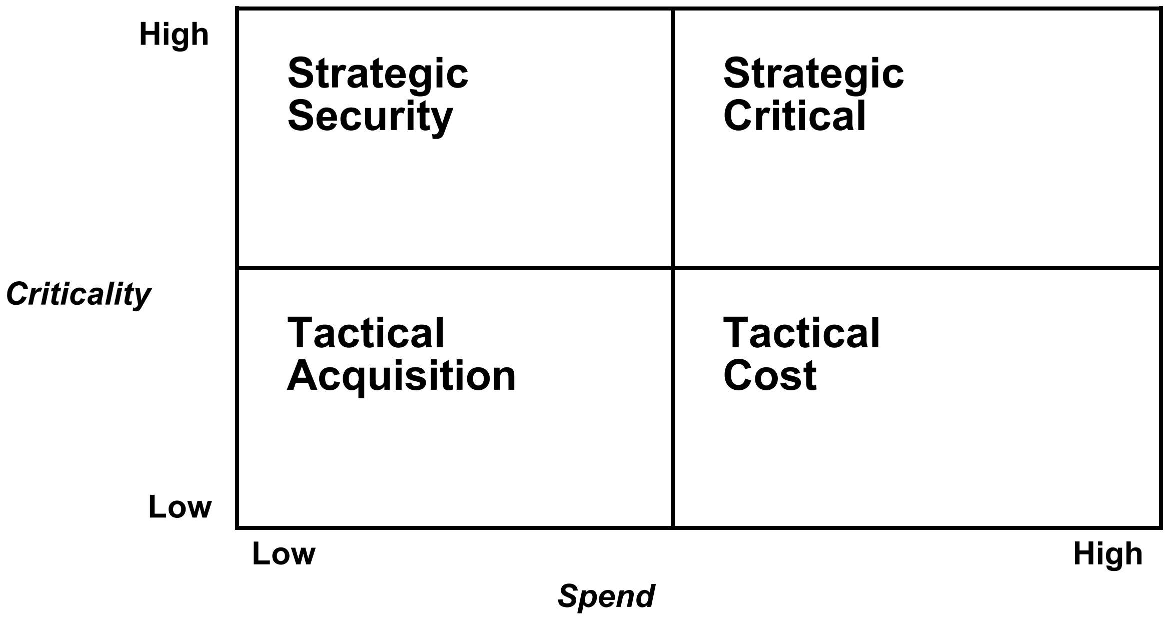
- Assessment of criticality to the project
- Review of current market situation and supply options (including financing strategy)
- Pre-qualification philosophy
- Specification
- Form of market approach
- Value, price and whole life costs
- Form of contract
- Alliancing
- Tender evaluation criteria or negotiation strategy and success criteria
- Performance and risk management (including insurance)
- HSE considerations, legislative and externally-imposed requirements
- Quality assurance and control philosophy
- Spares and stockholding strategy

These elements are considered in more detail as follows:

a. Assessment of criticality

The buying organisation acquires all manner of goods from sellers, ranging from very simple and inexpensive commodities to complex and expensive equipment and services. Clearly, it is inappropriate to engage in producing a detailed strategy for each simple transaction. Similarly, it is inadvisable to embark on a complex procurement process without giving careful consideration to the strategy to be adopted.

A simple 2x2 matrix as shown below has been found useful in determining the type of strategy to be adopted. In the diagram below, the amount being spent on the goods/services being purchased is plotted horizontally, and their criticality to the success of the overall project or business is plotted vertically. Criticality can be assessed from a number of considerations, including the availability of alternative suppliers, the effect of the quality of the goods/services on the overall success of the project, etc.



With reference to the matrix:

Tactical acquisition

When relatively small sums are being spent, and the goods/services being supplied are not critical, then a very straightforward procurement process focused on simplifying and reducing the cost of the transaction is appropriate. Examples include purchasing stationery, routine engineering supplies and spares, etc.

Tactical cost

Many commodities are readily available from a number of suppliers and represent a significant proportion of the overall project or business expenditure. In such cases, the main aim of the procurement process should be to reduce the price of the goods/services being supplied (while ensuring appropriate quality standards are maintained). This can be done by spot buying, short-term contracts, and encouraging competition in the marketplace. Items such as construction steel, fuel, and catering services may fall into this category.

Strategic security

Some goods/services cost relatively little, but their availability may be scarce or their influence on the success of the project significant. High technology materials and specialist consultancy services often fall into this category. While price is not irrelevant, the primary focus of any strategy must be on securing supply, developing contingency plans, and forming long-term relationships with suppliers which will encourage them to deliver their critical contribution on which the success of the project depends.

Strategic critical

Any project or operation will involve relatively high expenditure with a small number of key suppliers/contractors. Because of the large sums involved and the criticality of the goods/services being supplied, both price and performance are important. A strategy aimed at developing a mutually co-operative relationship which encourages openness and innovation, often with some element of sharing of risk and reward, will be most effective in such cases.

b. Market situation and supply options (including financing strategy)

Considerations here will include the availability of the goods/services required, including the current workload of existing suppliers, possible alternatives or options, and any financial considerations - for example, whether to lease or buy, how to handle foreign exchange (where appropriate), etc.

c. Pre-qualification philosophy

A range of factors will determine which, of all the possible contractors and suppliers, a buying organisation chooses to invite to tender. The list may be derived by carrying out a pre-qualification exercise, which should have many of the characteristics of a tendering exercise, for example:

- Clarity of purpose and communication
- A rigorous auditable process
- Selection criteria agreed in advance
- Objective processes for screening submissions
- Even-handed treatment of prospective tenderers

d. Specification

The buying organisation will usually be able to provide a detailed (technical) specification in the invitation to tender. It should be clear and objective, and include criteria for considering alternative bids. Standard and/or functional specifications will often allow tenderers to offer lower prices, and so should be used whenever possible. Care should be taken, when specifications are purposely not fully developed, to preserve the intellectual property of tenderers (see Section 1.7.2).

e. Form of market approach

Competitive tendering is the traditional and often most appropriate form of market approach. Properly managed, it is fair and will usually indicate the lowest price supplier. Other forms of market approach, such as competitive negotiation or single sourcing, may be more appropriate in some circumstances.

f. Value, Price and Whole Life Costs

The price paid for goods or services is frequently only one component of their cost. In order to arrive at the total cost, considerations such as maintenance and repair costs (and applicable warranties), lifespan, obsolescence, availability of spares, downtime consequences, reliability, etc. must also be included. To obtain an indication of the overall value of the goods/services, these costs must be set against the value-creating potential of the goods or services. The difference between purchase price and total cost has led to the concept of assessing tenders on the basis of life cycle cost or whole life cost, though this is often difficult to calculate accurately.

g. Form of Contract

The form of contract proposed will have a marked effect on the nature of the relationship between the buying organisation and the seller, and should be chosen carefully to match both the nature of the goods or services being purchased and the desired relationship. Turnkey, lump sum, bill of quantities, reimbursable, fixed fee, and various combinations of these main types of contract may each be appropriate in different circumstances.

h. Alliancing

A great deal of publicity has been given recently to the success of alliances, formed between the buying organisation and one or more sellers; extraordinary cost savings have been achieved in a number of cases. There is no specific definition of alliancing, or partnering. What is common to all such arrangements is that a previously adversarial relationship between the buying organisation and the sellers is replaced by a cooperative approach aimed at producing a more successful outcome or enhanced business result, the additional value of which is shared in an agreed way between the parties to the alliance.

An alliance may be appropriate when:

- The workscope or specification is not fully worked out or is capable of optimisation
- Benefits in terms of a better business outcome are likely to accrue from a co-operative relationship, and will outweigh the expense and effort involved in developing such relationships
- The various prospective partners have similar business philosophies and objectives

When forming an alliance, it is important to consider how many of the numerous selling organisations to involve. An alliance between the buying organisation and its main contractors may be suitable, but care must be taken to ensure that all parties in the supply chain are aligned, and that smaller enterprises (often sub-suppliers) are not treated unfairly.

There are major risks in entering into an alliance, and the downside of forming an alliance which fails can be significant. When successful, an alliance can, however, deliver extraordinary results beyond that which is normally achievable through more conventional business relationships.

For more details on alliancing, please refer to numerous papers in the public domain or the CRINE document 'Guidelines for Alliancing'. CRINE contact details are given in Section 5.

i. Tender evaluation or negotiation strategy

Before entering into any tendering or negotiation process, criteria for award of contract should be established. In the case of a competitive process, these will include identification of all the criteria to be measured (e.g. price, estimated whole life cost, technical and quality considerations, expertise of the individuals being offered, strength of organisation) and their respective weightings. If a single source process is proposed, then targets for successful negotiation should be set in advance. Negotiating tactics, including procedures to record all communications and protect the integrity of the process and of those involved, should also be agreed.

j. Performance and risk management (including insurance)

The guiding principle in any relationship involving buying organisation and seller should be for each to make a fair return on the transaction in return for accepting appropriate risk. This is true whether the goods or services involved are simple and straightforward or complex. The more complex or critical the goods or services, the more scope there will be for the buying organisation and seller to work co-operatively together to increase the value being created. This type of mutually-supportive co-operative relationship can often be encouraged by agreeing an incentivised form of contract (see ACTIVE VEP 5.2 Risk and Benefit Framework Agreements).

Insurance is a key tool in any risk management strategy. Buying and selling organisations view and use insurance in different ways. A fundamental principle which applies regardless of insurance strategy is that the purchase of insurance cover is no substitute for risk awareness and management.

k. HSE considerations, legislative and externally-imposed requirements

All projects will be subject to externally-imposed legislative requirements. Clarity at the tender stage about how these will be managed, and which of the various parties will assume specific responsibilities, will obviate many potential delays and disputes. HSE considerations may be both externally imposed or specified by the buying organisation. Again, explicit agreement about philosophies, targets, and management systems can be a key value driver for a project.

l. Quality assurance and control

Quality assurance and quality control (QA/QC) are often only considered following contract or order award. However, in common with many aspects of the procurement process, earlier consideration can yield significant savings. In particular, the contract or order can be constructed not only to include the usual warranties that the supplied goods or services are fit for purpose, but also some form of additional remuneration based on performance or reliability.

Regardless of such considerations, the QA/QC strategy should be carefully formulated within the buying organisation and agreed with the seller. Many problems occur because of easily avoidable practices, including:

- Imprecise specification by the buying organisation of the goods or services required
- Poor communications between the seller and buying organisation, making clarification difficult
- Unclear accountabilities
- Overzealous inspection by the buying organisation, which impedes the seller in the pursuit of his work

m. Spares and stockholding strategy

Traditionally, the buying organisation will purchase equipment, and subsequently purchase spares and/or maintenance services separately. There are a number of possible tactics which may result in a more efficient solution:

- Purchase spares at the same time as the equipment (as part of the same tender)
- Require the supplier to hold spares and deliver them as needed
- Purchase maintenance services at the same time as the equipment (as part of the same tender)
- Purchase maintenance services using performance of the equipment as the criterion for satisfaction and payment rather than a scale of maintenance charges (this is often called Total Vendor Maintenance - TVM).

1.7.2 Guidelines for Developing a Strategy for Tendering and Communications

A detailed discussion of effective tendering strategies is contained in the ACTIVE VEP 3.1, Procurement Cycle management. A number of points need to be considered in the procurement strategy:

- The cost of tendering - preparing a tender represents a significant expenditure for a prospective supplier or contractor. The buying organisation should not seek tenders from companies to which he has no intention of awarding a contract or order

- Clarity - the tender invitation should be as clear as possible to avoid the costs of clarification or misunderstanding

- A clear communications strategy, in which points of contact and communication processes are set out and understood by all parties, should be defined

- Functional specifications - tenders should, wherever possible, specify the function of the goods or services. This will allow the tenderer more freedom to offer the most cost-effective solution

- Coaching of tenderers - during the tender period, tenderers will frequently seek clarification. Responses from the buying organisation should, to ensure fairness, be made available to all tenderers. Less commonly, the buying organisation may work proactively with the tenderers, coaching them to produce their bids. This will only ever be appropriate for complex tenders being made in response to essentially functional undetailed specifications, and should only ever be attempted with the full understanding of and agreement to the process by the tenderers

1.7.3 Guidelines for Dealing with Intellectual Property Issues

In certain cases, especially when the successful contractor or supplier has special expertise or a new form of relationship or a novel design is being proposed, then involvement of prospective tenderers in shaping intellectual property agreements can be valuable. However, it is important that:

- All prospective tenderers are treated fairly and equally
- Tenderers are not required or even encouraged to spend disproportionate amounts of time and effort putting together pre-tender or tender submissions unless they are compensated accordingly
- Mechanisms are agreed for protecting the intellectual property of the tenderers

1.7.4 Guidelines for Developing a Strategy for Post-tender Negotiation

All but the most straightforward tendering process is likely to require some post-tender clarification with the prospective supplier(s) before a contract or order can be awarded. There may also be occasions when the buying organisation wishes to negotiate with the prospective supplier(s) following receipt of tenders with the sole view of reducing the price tendered; this is termed post-tender negotiation. This is quite distinct from the usual post-tender clarification, and different organisations will have their own views about the ethics and commercial wisdom of post-tender negotiation.

Generally, if a buying organisation routinely indulges in post-tender negotiation, then tenderers will soon begin to include a margin in their bids which they can give up during the post-tender negotiation process, rendering the strategy pointless.

Post-tender negotiation can be a useful way of combating specific situations experienced by a prospective buying organisation, for example:

- when the existence of a cartel among tenderers is suspected
- when all or part of a tender appears to be priced significantly above market indicators
- when variations between the tenderers' quoted specifications or terms and conditions are too wide to permit normal clarification and equalisation of tenders

The procedures for post-tender negotiation, including recording of communications, nominating single points of contact, and never having less than two people representing each party in negotiation sessions, should be rigorously applied.

1.7.5 Guidelines for Measuring the Value of the Procurement Process

'What gets measured gets done' is an aphorism much quoted to support performance assessment and benchmarking exercises. The value of measuring performance is now generally accepted.

Measuring the value created by the procurement process is never straightforward, mainly because it is rarely a repeatable event. Attempts are sometimes made to assess the performance of the procurement function. This can be either by measuring the efficiency of individuals (orders processed per day, though this is rarely relevant in modern organisations where such transactional procurement has been largely automated or procedures adopted to radically simplify the process) or by trying to distinguish the contribution of different parts of the organisation (e.g. engineering, project management, procurement) to the procurement process. This is at best difficult to do, and potentially very damaging when an organisation is trying to break down internal functional barriers and improve the procurement process itself. Arguments about whether a particular saving was made by engineering, procurement, or indeed through input from the contractor or supplier, are essentially wasteful and damaging.

A better solution is to measure the overall outcome against what might have been expected, and to benchmark processes, for instance the percentage of procurement activities for which strategies exist, quality of personnel involved in relationship development, or ownership of procurement by senior management, which, while indirect measurements, are more likely to yield useful results.

Workbook Cross References

VEP 3.1	Procurement Cycle Management
VEP 3.2	Supplier Selection
VEP 3.3	Contract Dispute Resolution
VEP 5.2	Risk and Benefit Framework Agreements
VEP 8.2	Contract Monitoring and Measurement

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 1.7 originated with the Procurement Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE PRINCIPLE 2

EFFECTIVE PROJECT TEAM MANAGEMENT

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ACTIVE PRINCIPLE 2

EFFECTIVE PROJECT TEAM MANAGEMENT

The effectiveness of a capital project will be determined largely by the people involved and how closely they are working to common, aligned objectives. This includes personnel from contractors, consultants or suppliers working on the project as well as in-house staff. Key elements necessary to achieve team effectiveness include:

- Clear leadership of a focused integrated team
- Effective selection processes for recruitment of staff and placing of contracts
- Team capability through inclusion of the necessary skills and competencies
- Clarity of roles and responsibilities within the team
- Effective and timely communications throughout the team
- Common understanding of project aims and how each individual effort contributes to those aims
- A ‘no blame’ culture with a readiness to learn from both success and failure
- Motivation to achieve the result and recognition of individual contributions
- Contractual arrangements which foster team integration

It is the responsibility of the project manager to direct and manage the project to achieve these necessary elements. The key is to establish a results orientated team culture from the outset, harnessing the skills of all team players to achieve commitment and ownership. Team building and regular involvement of the team in decision making and review are important ways in which this can be achieved. The contractual arrangements must also facilitate an integrated team approach and alliance or partner-type contracts are commonly effective in achieving this result.

To ensure that all team members are working effectively, it is essential that everyone shares a common understanding of the desired results, both final and interim, and a clear understanding of personal roles in achieving these. While critical success factors should be clear and demanding, targets should be realistic with agreed milestones.

To ensure effective motivation of all the team, incentives, including both personal and corporate reward incentives, should be considered. Disincentives should be used with care since motivation by fear can destroy trust and work against achievement of project objectives.

The competence 'mix' of the project team needs careful assessment. Shortcomings in capability should be redressed by appropriate training and education programmes which should be built into the project schedule.

Supporting Value Enhancing Practices:

VEP 2.1 Project Team Organisation

ACTIVE VALUE ENHANCING PRACTICE

No. 2.1 PROJECT TEAM ORGANISATION

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ACTIVE VALUE ENHANCING PRACTICE

No. 2.1 PROJECT TEAM ORGANISATION

Purpose and Benefit

Application of ACTIVE VEP 2.1 will assist in the creation of an effective project team organisation with improved working relationships. This will be achieved through the structured selection of participating companies and team members, clear definition of roles and responsibilities and the development of a supportive co-operative team culture. Through effective leadership and communication, individuals will develop a sense of shared ownership within the larger team and will perform and contribute more effectively to the project's overall success

Essential Activities

- Follow a selection process for contributing organisations.
- Follow a selection process for team members.
- Establish critical success factors.
- Identify clear roles and responsibilities.
- Develop and train project team personnel.
- Establish and maintain a team culture which addresses motivation, skills, knowledge management, challenge and change, communication and leadership.
- Set aggressive, achievable targets.
- Prepare concise co-ordination procedures.
- Establish a clear communication plan.

Each of the Essential Activities is described in more detail in the following Guidelines for Implementation. A Project Organisation Selection Questionnaire is included in Attachment 2.1-A.

2.1 Guidelines for Implementation

2.1.1 Guidelines for Selection of Contributing Organisations

Establish a clear and auditable process for selection of the type of organisations required as participants in the project. Selection should be based on the ability to contribute to the achievement of critical success factors for the project.

ACTIVE VEP 3.2 gives details of project processes for the selection of suppliers.

2.1.2 Guidelines for Selection of Team Members

Prospective team members should be made fully aware of the project goals and invited to identify how they could contribute to a successful outcome for the project. Selection of individuals is best done by a process of interviewing. The assessment should be judged on the awareness of the importance of team building, a commitment to this, and the ability to contribute to critical success factors.

Careful consideration should be given to the balance of the team and the ability of team members to work together. The use of psychometric testing techniques such as Meyers-Briggs or Belbin are useful in checking the balance of a team and avoiding personality clashes.

2.1.3 Guidelines for Establishing Critical Success Factors

The establishment of critical success factors at the outset of the project will help the selection of the organisations and individuals who will form the team. Critical success factors will typically address safety, health and environment, schedule, costs and operability. Each project must identify its own particular critical success factors.

See ACTIVE VEP 1.2 for more details on setting project objectives from which critical success factors should be derived.

2.1.4 Guidelines for Identifying Clear Roles and Responsibilities

Each role in the project organisation must be identified by well-defined responsibilities to ensure that all activities are addressed, and that unnecessary duplication of effort and man marking are eliminated. Individuals should be confident about their responsibilities and understand that they have the authority to undertake related decisions. There should be positive scope for leadership within the project team organisation and leaders should be encouraged to generate vision, motivation and effective communication within their individual teams. Bureaucratic hierarchies should be avoided and a flat, pro-active organisational structure should be developed to encourage full participation.

2.1.5 Guidelines for Developing and Training Project Team Personnel

Development and training of personnel throughout the project team is essential to raise competence and commitment for all the phases of the project life cycle. Although responsibility for long term training and development of staff rests with the employing organisation, it is crucial that the skills, knowledge and competence of all individuals working in project teams is assured. Hence project managers should ensure that all those involved in the project are assessed for capability and where necessary, appropriate training should be arranged.

The following training and development activities should be considered by project teams and employing organisations:

- Establish a system of formal assessment and appraisal on at least an annual basis, encouraging feedback between both the individual and manager and identify training needs

- Base career development planning on business requirements. Broader annual targets should be agreed with each individual within the employing organisation and performance reviewed annually. Within the project, specific targets in line with achieving project objectives should be agreed and performance reviewed at agreed milestones

- Employers should ensure that opportunities exist for individuals to work in different parts of the organisation, and individuals with potential should be encouraged to seek career development moves

Make full use of external training schemes which cover relevant project tools and techniques. Internal training schemes should be confined to covering business-specific aspects or areas not adequately covered by external schemes

- Conduct peer reviews of selected activities at predetermined intervals to provide feedback and guidance to individuals as a learning opportunity. Involvement of external organisations can increase the effectiveness of peer reviews

- Record lessons learned during all activities and establish a system for sharing this information throughout the organisation. Experience and knowledge gained by individuals during a project should be acknowledged and be transferable

2.1.6 Guidelines for Establishing a Team Culture

One of the early challenges for a project organisation is to promote efficient team working as quickly as possible. While individuals will have been selected for their ability to fit into the team, time must be made available to establish working relationships. To assist in this, the use of facilitated team building can provide the direction and challenge required to generate the openness and trust necessary between team members. It is necessary to maintain good team relationships throughout the project, and ongoing internal team building events are recommended on an as-needs basis.

The essence of team building lies in organising groups of individuals, usually from different corporate backgrounds, into harmonious and enthusiastic teams which share commitment to specific project goals. Team building may be carried out at various levels and stages during a project's development. Ideally it should be a continuous process.

Initially there must to be high level corporate commitment to a co-operative, open and trusting way of working. No amount of team building at lower levels, or at late stages in the project, will heal wounds caused by conflict or lack of commitment at the top. Involving a corporate company 'champion' or project sponsor to underpin the team building effort can be a useful tool.

The following guidelines are generic for any team at any stage in a project. The 'task' referred to could be the whole project, or a very specific but lesser task.

Team Formation:

- Establish team identity (Team charters or logos might be used)
- Hold orientation/briefing meeting (A 'Welcome pack for individuals' may be appropriate)
- Set clear goals for team and individuals
- Agree resource and programme targets for team and individuals

Maintaining Team Effectiveness:

- Measure and review performance
- Stay focused on the goals and maintain direction
- Motivate individuals
- Encourage a constructive competitive spirit
- Recognise individual efforts
- Stretch individuals but do not overload them
- Resolve problems and conflicts quickly without undue blame
- Encourage and facilitate social events

Introduction of New Members to an Existing Team:

- Hold an induction session
- Issue induction/briefing manual
- Gain commitment to team goals
- Agree individual resource/programme targets

Reshaping or Dismantling a Team:

- Debrief team members
- Celebrate success and recognise failure
- Acknowledge individual effort
- Capture and disseminate 'lessons learned'

2.1.7 Guidelines for Team Motivation

The following guidelines are important for generating and maintaining motivation of individuals and the whole project team.

Contract incentives

- Select the right type of contract and develop sensible contract pricing which is competitive but realistic
- Develop joint client/contractor incentives . Keep these simple and relevant
- Set realistic targets
- Take time out for forward planning. Establish priorities and intermediate target milestone dates which meet the overall project objectives
- Use positive rewards for good performance in preference to negative penalties for under-performance

Recognition and acknowledgement of achievement

Develop a project recognition and award scheme for achievements which could typically include:

- Best design for project logo
- Best idea for project cost savings
- Attaining project milestones
- Best solution to specific project problems
- Early completion

Maintain the self esteem of individuals

- Empower individuals to enable them to contribute to their maximum capability.
- Develop personal confidence in individuals and give due recognition for a job well done
- Understand that performance is delivered through people; provide a work environment and the necessary tools to allow people to perform at their best

Constructive competition

- Encourage a competitive spirit between individuals and groups and acknowledge exceptional performance through the award of team prizes etc.
- Small rewards will impart immediate recognition and contribute to team spirit, and can be more effective than complex incentive schemes

Personal development

- Recognise individual strengths and weaknesses
- Understand that individuals have personal objectives and capture and channel these energies into a common goal for the project
- Develop skills and provide opportunities for growth and the accepting of additional responsibilities
- Provide cross-training by understanding the drivers for client, contractor and suppliers
- Maintain a sense of balance between project demands and personal commitments in private life

Responsiveness

- Provide a timely and professional response in all supply chain relations
- Be concise but informative
- Develop a trusting and open relationship
- Be proactive and provide early warning of changes, technical, budget, or resource problems etc.

Avoid personal demotivators

- Inappropriate working environment and inadequate tools
- Unrealistic work load or targets
- Significant differences in pay/benefits within mixed work teams
- Poor co-ordination and information flow
- Constant change
- Obscure sense of purpose or fit within the team, cramping opportunity to contribute
- Lack of continuity or stability; fear of restructuring, downsizing or redundancy
- Poor perception of management's credibility

2.1.8 Guidelines for Resource Management

The following guidelines will assist with continuously addressing the level and mix of skills on a project and for ensuring the most efficient and productive use of individuals.

Selection and deployment

- Select the best person for the job
- Provide continuity of work where possible but with new challenges
- Provide sufficient resources to accommodate down time and replenishment of skills
- Define team requirements carefully and allow people to use their skills

Empowerment

- Ensure that team members are empowered to use their skills to best advantage for the project
- Avoid wasteful overlap or duplication of effort

Delegation

- Ensure that all team members and other relevant staff understand the need to delegate work effectively to optimise team capability

Environment, tools and training

- Ensure that individuals and teams are adequately supported with working environments conducive to high output
- Ensure sufficient and reliable equipment and tools (IT, CAD etc.) are provided, and that training is given to optimise their use

2.1.9 Guidelines for Knowledge Management

The following guidelines will help ensure that all relevant information and experience is captured and managed, in order to create a learning environment which will allow individuals and groups to make their best contribution to project objectives.

Project briefing

- Include exposure to major lessons learned on similar projects
- Make teams aware of the sources of useful information, including relevant databases, networks etc.

Commercial awareness

- Minimise commercial and technical barriers
- Ensure key team members understand the commercial framework of the project
- Promote understanding of the impact of technical decision making on the project's commercial outcome

Adopting and understanding relevant standards

- Identify all standards and practices relevant to the project and decide which of these are to be applied
- Avoid preference engineering
- Disseminate information and ensure it is understood throughout the team
- Consider factors such as location and cultural influences

Effective communication

- Create an environment of openness and trust
- Ensure the right information is available in a concise form at the right time
- Facilitate and encourage networking

2.1.10 Guidelines for Managing Challenge and Change

Significant improvements in performance will not be achieved on the basis of conventional 'business as usual'. Relationships, structures, procedures, practices, attitudes and other factors affecting overall performance need to be challenged and tested to ensure the project will maximise achievement levels. Where change is appropriate there must be a willingness to incorporate this in a positive and effective manner.

Challenge is defined as the opportunity for the project team or individuals to propose and develop alternatives and innovations aimed at enhancing the achievement of goals. These may relate to relationships, methods for conducting the work, or the details of the physical scope of the project.

Change is defined as the ability of the project team to assess, and where appropriate adopt, alternatives and innovations, and to ensure that these will improve the achievement of project goals. It is vital that the project goals are known, understood and accepted by the whole project team. They are the benchmark against which achievement will be measured and to which any challenge or change must be directed. Any proposed changes must enhance achievement of goals.

Constructive challenge and change cannot occur in an atmosphere of adversarial contractual relationships. Contracts must therefore be written and understood by all involved such that controlled challenge and change are possible and the costs and benefits are fairly allocated between the parties concerned.

It is crucial that the proposed approach for the project, including the procedure for the management of challenge and change, has full support at senior management level in all supply chain organisations. Where subcontractors and vendors are involved similar support must be achieved from their senior management.

Organisations and individuals must be flexible in attitudes and support the challenge/change process, and be aware of the benefits to be derived from successful implementation.

A management system is necessary for the efficient evaluation and incorporation of those changes which merit adoption, and for avoiding the risks of diverting valuable time and resources to ideas not meeting the adoption criteria. This applies to changes not only related to physical scope, but also to time, procedures, methods of working etc. In each case change must be handled in a controlled manner. 'Change for change's sake' is to be rejected.

The challenge/change procedure must be established at the outset of the project with the agreement of all parties. It is important that the management system is capable of assessing the overall impact of any change to ensure potentially negative aspects do not outweigh likely benefits.

It is important to identify the key challenges facing the project to ensure that all concerned understand these, and that strategies for meeting them are jointly developed. It must be recognised that as the project progresses the key challenges and/or the approach to their solution may change. This, in turn, needs to be 'sold' to all those involved with the project. The challenge/change system will be an important tool in meeting the project's key challenges.

Project leaders at all levels must actively manage challenge and change. It is important to encourage innovation and improved practices where appropriate, but to avoid these occurring in an uncontrolled manner without clear reference to project goals.

To managing challenge and change successfully, project leaders should:

- Encourage all in the team to raise ideas and, as appropriate, be involved in development of changes
- Ensure that before any change is adopted, all the foreseeable effects of the change are carefully assessed and that it is clear that the benefits outweigh the disadvantages
- Effectively communicate challenges, and, where changes are to be adopted, the reasons for them, how these will be implemented, and the foreseen impact
- Ensure that any challenges, ideas, innovations etc. are rapidly reviewed in a systematic manner and categorised for further action if appropriate
- Provide training in new techniques, procedures etc.

For skills and experience of individuals to be maximised it is important that there is a project culture which accepts questioning and suggestions for improvement. Managerial staff need to respond positively, while ensuring that questions and suggestions do not unnecessarily disrupt the progress of work. It is also important that individuals also understand that in many cases change must be constrained in view of other limitations on the work, particularly cost and time and the need to maintain the overall team objectives.

A process of focused peer reviews should be used at intervals in the development of the project to verify and provide guidance in the transfer of knowledge and experience. This is necessary to check that the challenge/change culture is operating effectively in order to achieve project goals most effectively.

There is an associated role for senior management of all participating companies to audit and encourage challenge and change and to ensure that the system is being appropriately applied to the project.

Great benefit can be derived from reviewing the successes and failures on a project in order that learning can occur for the future. For this to occur, the working environment must foster involvement of individuals from all relevant organisations to contribute openly, objectively and honestly with encouragement from senior management. Benefit will be increased if findings are published. The review can be used as a tool in the challenge and change of procedures, practices, and relationships for future projects.

2.1.11 Guidelines for Project Communication

Establishing the framework for effective communication requires the development of a project communication plan as a critical and early project activity. The plan should address methods for motivating the team, the information which needs to be exchanged both internally and externally, methods of exchange, the parties involved, budget and timing.

Teams and individuals function more effectively when there is an understanding of the overall project scope and the potential risks and rewards. Informed decision-making and ownership is enhanced when the risks or incentives are clearly understood by all project personnel.

- 'Up front' communications planning is required; an ad-hoc reactive approach is inefficient and costly
- Review all the options for communicating information including notice boards, photographs, newsletters and written reports, taking account of the size and makeup of the team, culture, and budget
- The requirement for induction and refreshers for every member of the team should be addressed and must take account of staggered team mobilisation
- Evaluate the most effective method of cascading progress information to the entire team, for example through coffee and doughnut sessions, newsletters, notice boards, in order to help all team members feel informed and therefore involved
- Lessons learned from previous projects need to be communicated effectively, discussed and incorporated where applicable. It can be expensive to 'reinvent the wheel'
- Team feedback during execution should not be ignored. Most members of the team have worthwhile suggestions to make to enhance performance
- Lessons learned from the current project must be communicated in a clear and understandable manner for future projects
- Endeavour to create a project environment which engenders trust, openness and respect. Individuals respond better when they are told the truth
- The project manager must ensure he is kept fully informed and should set up a system within which this can happen, without causing conflicts of interest. For example, certain meetings may need to be 'warts and all' where as other meetings may require more judicious disclosure. The project team must be able to be honest with the project manager
- An atmosphere of openness, respect and trust reduces the likelihood of inefficient man-marking, bonds the team together and reduces the occurrence of expensive last-minute surprises
- Critically assess the objectives of meetings and whether meetings are the most appropriate medium to achieve the objectives

- Be disciplined about attendees, durations, agendas, notes of meeting and follow-up of actions
- The presentation skills of the project manager are very important in effective communication and team motivation. The project manager should determine how the project's mission statement will be communicated to the team and identify where training in communication and presentation is required

2.1.12 Guidelines for Leadership

In the project team, a leader is a person charged with, or who emerges, to undertake a task through directing others.

Leadership is the ability to know when to provide direction, coaching, support or delegation such that the contributions of individuals and the team are maximised toward the desired project outcome.

Good leaders should seek to demonstrate the following qualities:

- Trust, openness and active listening
- Empathy
- Respect for others
- Support for a blame-free culture
- Inspiration
- Motivation
- Influence
- Leading by example

Potential benefits of good leadership

- Defines project goals clearly
- Develops stronger teams
- Encourages empowered working
- Encourages free thinking and innovation
- Exploits full potential of each team member
- Enhances self esteem of individuals
- Motivates team members
- Encourages team ownership
- Solves problems by team effort
- Encourages feedback and continuous improvement

Individuals or teams often have ability, enthusiasm and confidence to complete a given task, but frequently need additional help from a leader. For example if the individual or team has little knowledge of how to complete the task but has plenty of enthusiasm, the leader must:

- Set clear objectives at the start
- Establish the priority of the task
- Ensure a plan of action is completed at the outset
- Ensure the correct methods are adopted
- Set minimum quality standards of work
- Supervise as the task develops by helping to solve problems
- Provide the necessary information
- Give regular and detailed performance feedback

When a situation requires coaching

When the individual or team has some knowledge of how to complete the task but has only moderate enthusiasm, the leader must:

- Agree the objectives at the start
- Agree the task's priority
- Ask questions to establish current situation
- Ask questions to reveal options and ideas
- Listen and provide alternatives if required
- Encourage, reassure and give practical support
- Share problems, decisions and responsibilities
- Give regular performance feedback

When a situation requires support

When he individual or team has the knowledge to complete the task but not the confidence, the leader must:

- Allow them to set the objectives
- Allow them to take responsibility
- Encourage, reassure and give practical support
- Motivate and build self-confidence
- Remove barriers if required
- Promote teamwork
- Give occasional feedback on performance
- Encourage self-development

When the situation requires delegation

When the individual or team has both the knowledge and enthusiasm to complete the task, the leader must:

- Trust them with full authority
- Provide the big picture through policy and strategy
- Encourage them to self-assess progress
- Encourage them to involve all of the team
- Be a mentor for self-development
- Ensure there are new and varied challenges
- Give occasional feedback and recognition
- In other words: 'Get out of their way'

2.1.13 Guidelines for Setting Aggressive Achievable Targets

Target setting is a very important task. The difficulties and risks involved should not be under estimated. Targets can be set for the project's critical success factors and should be based on the strategy submitted at project approval stage. An understanding of past 'best in class' performances will assist in setting aggressive, yet achievable targets.

‘Stretch targets’ can also be established to push the project performance beyond best in class. It is not advisable to publish stretch targets outside the project team. These should be held as confidential to the team and not published until the team agrees that they have become achievable. If stretch targets become common knowledge then they can turn into unrealistic expectations by senior executives of the organisations involved. Teams are often unwilling to accept ambitious stretch targets under these circumstances.

For further details see ACTIVE VEP 1.2 and ACTIVE VEP 8.1.

2.1.14 Guidelines for Preparing Co-ordination Procedures

A concise set of project co-ordination procedures should be produced at the outset. These can be based on existing procedures held by member organisations, or on procedures from past projects which may be applicable with minor modification. Advice incorporating lessons learned from the previous owner should be incorporated into the procedures in order to stimulate continuous improvement.

2.1.15 Guidelines for Establishing a Communications Plan

A plan is required to ensure all project personnel are kept fully informed of developments and progress, in order to maintain common ownership of successes and failures. Publication of successes should be encouraged. Systems to achieve this include quarterly bulletins such as project newsletters, monthly reports, and press releases where appropriate.

Workbook Cross References

VEP 1.1	Project Process
VEP 1.2	Project Definition and Objectives
VEP 3.1	Procurement Cycle Management
VEP 6.2.3	Establishing a Challenge Culture
VEP 6.2.5	Capturing and Applying Learning
VEP 7.2.4	Guidelines for Review

Further Reading

CII RR103-11 . Optimising Project Organisation. Research report.
Refer to Section 5 for CII contact details.

For CII contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 2.1 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

2.1-A Project Organisation Selection Questionnaire

ACTIVE VALUE ENHANCING PRACTICE

No. 2.1 PROJECT PROCESS

ATTACHMENT 2.1-A

SELECTION OF PROJECT ORGANISATION: SAMPLE QUESTIONNAIRE

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ATTACHMENT 2.1-A

SELECTION OF PROJECT ORGANISATION:

SAMPLE QUESTIONNAIRE

1. Behaviour and Attitude

1.1 (Project Description)

(a) Why you consider this to be the correct approach for the project;
or,

(b) Could you suggest an alternative approach that you consider would be more beneficial for client, partners, contractors and suppliers.

1.2 In the event that a collaborative approach is adopted for the project, identify the participants you consider should be involved. Describe your project and contracting strategy, including risk management and the proposed forms of contract. How would you manage your interfaces with the other participants to eliminate inefficiency?

1.3 How would you take advantage of the different skills of all the participants in your development of the organisation(s)?

1.4 Does your executive management support the ‘risk and reward’ concept and, if so, describe their proposed involvement with the project. What impact would the implementation of risk and reward arrangements have upon the provision of parent company guarantees?

1.5 How will you demonstrate your commitment to be accountable for the scope of services to be supplied and the management thereof?

1.6 What are the key elements of the contribution you would make to the project? What, in your view, distinguishes you from your competitors?

1.7 How would you demonstrate commitment to and alignment with critical success factors? Describe how you would enrol all members of your team to accept ownership of issues and risks towards achieving an extraordinary result.

1.8 What would <u>your</u> Minimum Conditions of Satisfaction be and how would these assist in achieving success for the project? In what ways could the client and the other participants assist you to improve the overall results for the project?

1.9 Provide details of your Code of Ethics and Business Conduct and demonstrate your alignment with the client's approach to the project.

2. Team Members

2.1 Which named individuals would be responsible for delivering your commitment to the project? Advise if they are staff or agency employees. Give details of any targets for the ratio of staff to agency personnel.

2.2 What are your proposals for the integration of client personnel within a joint team? Identify any specific positions where you consider the client could add value.

2.3 What assurance processes will you employ to ensure that personnel working on the project are competent for the role required of them? Detail any processes for development of personnel.

2.4 Each lead engineer is required to provide a short (not more than two pages) dissertation on how he/she will coach his/her team towards an extraordinary result for the project.

3. Innovation and Technical Competence

3.1 What innovative proposals, including innovative methods of working, are you able to offer with a view to reducing the overall cost of the project? How do you intend to manage the use of new technologies?

3.2 What are your proposals for ensuring that the design recognises the specific requirements of interfacing contractors and what do you see as the key success factors in these relationships?

3.3 What are your proposals to reduce the complexity of the design without compromising overall design requirements and without a net increase of materials and packaged equipment costs?

3.4 What are the most likely areas for increased cost during the design process and how do you propose to control the same while still meeting safety, operational cost and production objectives? How do you propose to minimise the cost of quality assurance, while maintaining appropriate quality standards and without client intervention?

3.5 What systems and processes would you use to ensure that the developed design achieves optimal constructability, operability and maintainability?

3.6 What do you perceive to be the key activities at the interface between project activities (e.g., design and construction) where opportunities exist for improvements?

3.7 What Formal Safety Assessment (FSA) activities and programme are proposed to meet legislative compliance (including likely new safety regulation requirements). Provide supporting details including key safety related deliverables and indication of manhours required.

3.8 How will the proposed FSA activities and programme be integrated into design and Safety Management System (SMS) development to demonstrate that risks to personnel, temporary refuge(s) and other key functions are acceptable and are in accordance with the principle of ALARP (As Low As Reasonably Practicable)?

3.9 What design philosophies and standards will you employ to deliver facilities which are safe, operable and require 'minimal intervention' whilst minimising project life cycle cost? How will these be applied for the specification and procurement of materials and equipment?

3.10 What strategy would you adopt to ensure that the overall design remains sufficiently flexible to absorb future changes which will arise as design development proceeds?

3.11 What do you perceive to be the key design issues, areas of technical risk and major cost drivers associated with the facilities and how would you address them?

4. Systems

4.1 What are the processes you will use to ensure that decisions and recommendations are made on the basis of maximising value over the total life of the project?

4.2 What is the suite of project control procedures that you would employ for the project to ensure work processes are effectively regulated?

4.3 What are the systems you would use to ensure that all aspects of the design are effectively controlled, both within the design function itself and at its interfaces with other functions, and ensure design integrity is maintained? Provide details of recent application experience for each system.

4.4 Provide details of the procurement systems that will assist in delivering the procurement strategy. What procurement processes will you adopt to ensure that the clients' obligations comply with EC regulations are properly discharged?

4.5 What are your proposals for the measurement of the key elements of the work you would undertake?

4.6 What systems do you employ to identify and evaluate lessons from your performance on previous projects, and how do you ensure that these lessons are considered and adopted on subsequent projects? Give some recent examples of success in this area.

4.7 Describe how you control costs (as opposed to reporting costs). Advise how you will manage your cost control within the organisation.

5. Experience and track record

5.1 If you are unable to perform the entire required services from your in-house capability, which subcontractors would you propose to use and for which areas of the service? How will you evaluate a subcontractor's capability to perform the work?

5.2 State the manhours and durations you expect to require for the different aspects of the project. Relate this to your five most recent performances on work of an equivalent nature detailing the manhour expenditure in engineering, procurement, support services and follow-on engineering.

5.3 State the performance targets (such as design norms) you would expect to achieve. Also, state the performance targets (such as fabrication norms) that you would expect from other contractors who will be employed on the project and have significant influence on the final cost. What performance targets would you expect to be agreed with each of these contractors?

5.4 Describe the extent of previous and current involvement and responsibilities in the area of safety, health and the environment. How is this experience and knowledge retained within your organisation and thus reflected in your proposals for the project.

5.5 Submit details of your experience of developments over the last five years that is specifically relevant to the project.

6. Organisation

6.1 Detail your company's resource capacity to undertake the services required for the project recognising the indicated timescale.

6.2 What organisation would you propose to use to deliver your commitment to the project? Submit organisation charts for each phase of the project from front end engineering design through to operational support and identify key personnel for each phase. Identify key features of this organisation and describe why it is different from the 'business as usual' approach, and how it will lead to an extraordinary result for the project. Indicate where you would expect support from the client.

6.3 Are there post production start-up and logistics activities to which you could add value and for which you are prepared to be accountable?

6.4 Describe all critical paths related to the overall project plan and your proposal for mitigating the programme risks associated with them.

7. Commercial

7.1 What are your proposals for sharing risk and reward equitably with the client? For which elements of risk are you prepared to be accountable and which do you wish to exclude? What is the level of commercial risk to which your company is prepared to commit?

7.2 How will you ensure that you achieve a level of profitability that reflects the success of the project?

7.3 To what extent will you underwrite your work in terms of future operational performance?

7.4 Do you have proposals for adding incentives to the early engineering phase of the project?

7.5 Are you able to offer innovative proposals in respect of financing?

ACTIVE PRINCIPLE 3

EFFECTIVE SUPPLY CHAIN RELATIONSHIPS

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ACTIVE PRINCIPLE 3

EFFECTIVE SUPPLY CHAIN RELATIONSHIPS

Project relationships should be focused on encouraging the whole supply chain to act in unison to achieve clearly stated project goals. Overall supplier contribution in terms of broader project benefits must be recognised, rather than judgement being based solely on price. Within the context of the project objectives, innovation should be fostered and an equitable sharing of risk and reward should be incorporated into the commercial relationship.

Within the process industry it has only recently been recognised that to achieve business competitiveness, project performance is as important as superior product and process technology. For projects to be successful the entire supply chain must be aligned to project objectives, while proper apportionment of risk and reward should provide the opportunity for all participants in the supply chain to benefit.

All members of the supply chain, whether owner/operators, contractors or suppliers, should work together to maximise value, rather than seeking to move cost or risk up or down the supply chain. In this way competitiveness for both buyers and sellers can be improved.

Supply chain relationships develop over the life cycle of the project. The framework established at the outset of the project which defines the relationship should provide the basis for prompt resolution of problems as they emerge and provide an effective and timely way of meeting mutually beneficial objectives.

The application of this ACTIVE Principle will benefit all parties through a more equitable apportionment of risk and reward, greater clarity of project objectives, active participation in the creation of value throughout the supply chain and elimination of unnecessary cost. Where appropriate, these objectives may be achieved through an alliance partnership or risk and benefit framework agreement in which the parties formally take a stake in the project outcome, sharing risks and benefits in line with their stake. Key elements for supply chain improvement imclude:

- Establishing clear targets and objectives
- Alignment of objectives between buyer and seller.
- Effective and open communications between all parties
- Establishing a relationship appropriate to the business being conducted
- Encouraging innovation within the constraints of the project objectives

With these elements in place, the effectiveness of the supply chain will contribute to the long term performance of the industry. Confidence between buyers and the sellers will, over a period of time, develop into trust, thereby creating effective and long lasting relationships which benefit all parties.
The changing demands of buyers can be accommodated by an efficient and responsive supply chain provided there is proper recognition of the effort and resources needed to deal with the challenge.

Only by striving to create a value based supply chain with a vision to create a globally successful industry which encourages reinvestment, will the long term future for the industry be assured.

Supporting Value Enhancing Practices:

VEP 3.1	Procurement Cycle Management
VEP 3.2	Supplier Selection
VEP 3.3	Contract Dispute Resolution

ACTIVE VALUE ENHANCING PRACTICE

No. 3.1 PROCUREMENT CYCLE MANAGEMENT

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ACTIVE VALUE ENHANCING PRACTICE

No. 3.1 PROCUREMENT CYCLE MANAGEMENT

Purpose and Benefit

The effective supply of goods and services on projects has the potential to benefit all parties in the supply chain. Through better contract processes, alignment of behaviour and goals, and the encouragement of innovation, the procurement cycle can be improved with the result of adding value to the project. Application of ACTIVE VEP 3.1 will assist in developing and managing a more effective procurement cycle.

Essential Activities

- Adopt professional business ethics, comply with laws and regulations, and maintain recognised standards for safety, health and the environment
- Consider co-operative contractual relationships, for example, partnering or alliances
- Apportion and manage risk and benefits equitably
- Adopt consistent, clear and agreed procurement strategies at the outset
- Assure confidentiality for innovation and intellectual property
- Eliminate unnecessary documentation
- Define scope and functional requirements clearly
- Ensure contracts properly reflect the intentions of the parties
- Ensure supplier selection is a fair and effective process
- Monitor and measure contracts against agreed goals

- Ensure payment arrangements meet contractual obligations
- Ensure disputes are resolved speedily and cost effectively
- Ensure lessons learned are of mutual benefit through continuing relationships

The Essential Activities are discussed in the following Guidelines for Implementation.

Guidelines for Implementation

3.1.1 Guidelines for Business Ethics

Companies are expected to maintain the highest standards of integrity and professionalism in their supply chain relationships, acting within both the spirit and letter of the law, to an agreed code of business ethics and with due regard to safety, health and the environment.

Trust, confidence and respect between buyers and sellers are key issues for profitable and ongoing business for both parties. It is important that business is conducted within an agreed ethical framework, meeting the legal and regulatory requirements of the territories involved and in accordance with behaviour consistent with the highest standards of professionalism and mutual respect.

High ethical standards will enable both buyers and sellers to establish mutually beneficial relationships which can be developed, expanded and maintained to ensure that the best possible outcomes for all parties are achieved.

- All business activities throughout the procurement cycle should be characterised by honesty and routinely audited for deception and fraud
- Buyers should be aware that accepting inappropriate gifts and entertainment offered by sellers, especially during the bid process, could result in a conflict of interest in future negotiations
- The relationship between buyers and sellers should be such that the integrity and reputation of the parties involved would not be damaged if details of the relationship in dealing were to become public knowledge
- Companies have a responsibility to ensure that defined ethical standards of behaviour are communicated and applied to their staff at all levels

- Companies should adopt high standards of health and safety which protect personnel and the working environment
- Companies should set targets for improving safety and protecting the environment
- Companies should work together to ensure that regulatory and mandatory requirements are fully met for the project

3.1.2 Guidelines for Partnering and Alliances

Successful projects are those that bring business benefits to the user, requiring the alignment of the whole supply chain to achieve this goal by apportioning risk and reward to mutual benefit. This has been achieved on some recent projects by the adoption of partnering or alliancing arrangements in place of more traditional contractual relationships.

Partnering or alliance arrangements are co-operative relationships between two or more parties where objectives are aligned to deliver enhanced results for all parties, with a defined mechanism for apportioning risk and reward. To be successful, alliances must be considered in the early stages of a project and the choice of partner or partners will depend on the skills and resources needed to cover the scope of the alliance. The term alliance is usually applied to the larger, more significant projects and will usually involve the operating client as well as the managing contractor. Indeed, where the ‘gainshare/painshare’ concept is extended to partners taking equity stakes in the business outcome of project, the principles of alliances also cover consortia and joint ventures. For smaller ventures or specific parts of the supply chain, partnering arrangements or risk/benefit framework agreements may be more appropriate, but the underlying principles remain the same.

At the outset of a potential alliance or partnership, each party should establish its own critical success factors and be clear about its expectations from the relationship. These critical success factors form the basis for the development of the alliance or partnering contract as partners move through the alignment process.

An alliance may be preferable to a conventional contractual relationship if:

- The scope of the work is not well defined in advance
- Medium/long term benefits can be perceived from the trust and closer relationships built up in an alliance, justifying the extra time and cost needed to set up this type of relationship

- There are synergies between the partners' cultures and broad alignment of philosophy and objectives

- There is specialist, complex expertise required as a key component of the project

Alliances are not an 'easy option' and should not be seen as a loose or cosy relationship. They should be developed and conducted on a businesslike basis with properly negotiated contractual arrangements in place between the parties. Since alliances need to be tailored to suit the needs of both the project and the partners involved, there is no 'standard form' of alliance contract and hence alliances often take longer to establish than traditional contracts. Alliances must also take account of the need to change with time as relationships develop and business circumstances and project needs change. It should be recognised at the outset that an alliance is likely to change fundamentally the way business is conducted between the partners.

Alliances can be applied to a wide range of projects including greenfield or brownfield plants, revamps, small projects and major turnarounds. To establish an alliance, prospective partners should meet to discuss and negotiate how the responsibilities for achieving objectives will be shared and which control and communication mechanisms are needed for the running of the alliance. The degree of risk (or 'painshare') and the potential benefits ('gainshare'), how these will be apportioned, and whether any caps should apply, are issues to be negotiated with each party.

The contractual relationship should address such issues as how each of the parties will interface and work together and must include processes for the resolution of disputes should they arise. If applicable, the alliance must address how compliance with European Union Directives or other competition law requirements will be satisfied.

Critical factors for successful alliances include the following:

- Openness and non-adversarial attitudes based on mutual trust

- Commitment from all levels within the alliance partners. Senior management commitment is essential within all partner companies

- Clarity of roles and responsibilities within the alliance

- Alignment of business, project and operational goals

- Joint agreement of performance targets and measures

- Allowance for the alliance relationship to develop with time

- Operation of a single, integrated team for the project
- A supportive, positive and co-operative culture within the partner companies

Alliances, where successful, have generally enhanced project performance for all parties compared with traditional contractual arrangements. However, should alliances fail, the risks for the parties involved may be considerable and may be worse than problems in a traditional contract.

The following pitfalls should be avoided:

- A failure to realise the degree of commitment that an alliance will require from all partners
- Unrealistic expectations of continuing gains over the term of an alliance relationship
- Intentions and objectives which are not shared or visible
- A failure to recognise the effect of an alliance on parties' in-house organisations
- Complacent and cosy relationships removing the need to be competitive and innovative
- Alliance parties becoming too interdependent or insulating themselves from the market
- A belief that alliancing is just a marketing tool or, worse, a way of offloading risk or overheads
- Failure to understand the importance and full implications of accepting risks as well as rewards in the alliance relationship

Critical to the success of an alliance is the basis of the apportionment of risk and benefit. Further details on one way of approaching this can be found in ACTIVE VEP 5.2 on Risk and Benefit Framework Agreements.

For alliances in general, the following factors are important:

- Rewards should be focused on meeting or surpassing the business objectives or project goals

- Rewards should be based on collective performance and each party's share should be related to its ability to influence that performance
- Rewards should relate to willingness to accept risk
- There should be the opportunity to share extra reward for extraordinary performance
- Calculation of the share of any gain or loss must be clear
- Capping of any share of loss or reward must be explicitly defined
- Risk and reward may include a whole-life cost component
- A mechanism should be in place to review risk and reward should the scope of work change beyond pre-defined limits

3.1.3 Guidelines for Contract Behaviour

Individuals should behave in a co-operative manner at all times within the supply chain. Open, honest and straightforward methods of communicating information should be used to facilitate contract delivery and ensure project success.

Effective implementation of the post contract phase relies on the genuine desire of buyers and sellers to deliver contracts in a way that will be effective and add value at all points in the supply chain. This requires all parties to recognise that a change in culture, from an adversarial approach to one that is more co-operative, is essential.

To achieve this, commitment of time and resources is required at the outset to develop a team approach whereby both client and vendors work together toward common project goals.

The key factor is the need for mutual trust. Trust only develops over a period of time as the parties work together and gain confidence in working to common goals. The key is to establish the culture from the outset and ensure that all parties are clear about their roles and responsibilities in achieving the shared goals. In this way, problems can be resolved quickly and effectively in an atmosphere of honesty and co-operation.

Key behavioural factors include:

- Commitment of all parties
- Continuity of involvement of key staff
- Sound morale and team spirit
- Training
- Shared understanding
- Non adversarial culture

3.1.4 Guidelines for Risk Management

The principle for the management of risk within contractual relationships is that risks should be managed by the party best equipped to deal with each risk at least cost, and that potential benefits reflect the degree of risk borne by each party. Sharing risk with other parties inevitably leads to a corresponding transfer of all or part of the potential benefit resulting from the avoidance or limitation of that risk. In any supply chain relationship, it is essential that a framework is established that clearly assigns responsibilities, and establishes the relationship between risk and benefit.

Further details of how a risk and benefit framework agreement can be developed will be found in ACTIVE VEP 5.2 Risk and Benefit Framework Agreements.

3.1.5 Guidelines for Procurement Strategies

Procurement is the process of acquiring goods and/or services from another company or organisation. It is an important business process in any project, and a key value driver both in reducing costs and encouraging innovative solutions through co-operative relationships. As with any business process, developing and implementing an effective strategy at an early stage is critical to a successful outcome.

Further details on the development of an effective procurement strategy will be found in ACTIVE VEP 1.7 Procurement Strategy.

3.1.6 Guidelines for Innovation and Intellectual Property

Companies are expected to encourage innovation throughout the supply chain and to respect confidentiality. Innovation should be rewarded at all stages of the procurement process from feasibility to completion by an equitable sharing of benefits, and protection of intellectual property rights.

Further details of this topic are included in ACTIVE VEP 6.2 Innovation and Intellectual property.

3.1.7 Guidelines for Documentation

Within contractual relationships, companies must work together to eliminate unnecessary documentation. The focus should be on concise and timely preparation and issuing of specific key deliverables. Companies should exchange information electronically where practicable and appropriate. Further details on documantation are included in ACTIVE VEP 4.1 Information Management.

3.1.8 Guidelines for Scoping

Companies must clearly define the scope of the goods and services to be procured as well as the responsibilities of the contracting parties, including defining interfaces. Scoping will focus on defining functional requirements, thereby encouraging innovative ways of meeting the performance criteria.

Successful contracts clearly define the roles and responsibilities of all the parties to the contract. Clarity of the scope of supply (and also defining that which is not to be supplied) is crucial to effective performance by suppliers. Problems with scoping often have their root cause in inadequate definition within client organisations. Sometimes this is because the overall objectives for the project have not been properly thought through and articulated by the client resulting in scope growth as the contract proceeds.

Defining the scope of a contract must be done thoroughly. Any potential misunderstandings between buyer and seller will result in subsequent contractual problems. The most successful contracts are those where the suppler has rigorously reviewed with the client the assumptions and assertions in the scoping document. Vendors are often reluctant to do this on the mistaken assumption that the 'customer is always right'. A good supplier at this stage can often persuade the buyer to check within their own organisation on whether the proposed scoping assumptions are secure. Both buyer and seller at this stage should ensure that they have an agreed scope which does not have 'loose ends' around the interfaces. It is crucial to define the extent of scope and how the interfaces with the client and with other suppliers or contractors will be managed.

The tradition for large client companies has been to define requirements for scope of supply in great detail which often leaves little room for suppliers to develop ways of meeting requirements more cost effectively. Many clients spell out the 'how' as well as the 'what'. Functional specifications, where the buyer defines functionality requirements but leaves the vendor to define how that functionality is achieved, has been used to great effect within the offshore industry's CRINE initiative as a way of simplifying the procurement process, encouraging innovation by suppliers and reducing overall costs. ACTIVE recommends that this approach should be adopted, although it is acknowledged that the greater diversity of technology and process equipment in the onshore industry makes it more difficult to standardise.

For the functional approach to be effective there is an increased need for buyers to have confidence that suppliers have the required competence to deliver the requirements. This increases the need for prequalification of suppliers.

3.1.9 Guidelines for Types of Contracts

Companies must define contractual requirements between the buyer and seller, choosing a form of wording that is understandable and which truly reflects the intentions of the parties. This may include the use of standard forms of contract, but only if appropriate to the needs of both parties. Organisational methods employed on projects are varied, leading to differing types of contract arrangements to cover design, organisation and management of projects. Projects usually run from concept to commissioning, and occasionally include a specified period of operation. Contract types must be matched to the project circumstances and the contracting arrangement. Widely used contract types include:

- **Firm Price, Fixed Price or Lump Sum**

  A non variable price to be used when scope and risk issues are well defined or can be developed, thus allowing greater certainty of outcome and the transfer of risks to the contractor. Variation formulae can be applied to allow for escalation or exchange rate uncertainties, where these have not been allowed for within the agreed price

- **Target Cost**

  Used when project and estimate definition is well defined, but is insufficient for fixed price agreement. An estimate or target is agreed, usually with a maximum price that limits the costs to be paid to the contractor. The client and contractor share in the savings or overruns beyond the target, often referred to as the 'risk and reward' concept

- **Unit Rates**

  Agreed price rates for work, best suited where scope is being progressively established and work can only be authorised in packages. Provides flexibility of authorisation and lower contractor risk

- **Cost plus or Reimbursable**

  Applied where project outcome and scope is uncertain, allowing contractor to recover costs as incurred, plus fee and/or percentage profit. Involves minimal incentive or constraints on spending and should be sparingly applied, and only if accompanied by limitations on expenditure (such as a maximum price) and incentives to constrain spend.

The method of reimbursement could be one of the above types or, indeed, a hybrid of one or more: for example a reimbursable arrangement linked to a target cost. The conditions of contract should clearly reflect the intentions of the parties and the method of reimbursement selected. There are several model forms of contract specifically designed to suit the various methods of reimbursement. Two commonly employed model forms are listed below. It should be noted that these are examples only and not recommendations since the most appropriate model form will depend upon the nature of the project.

- **The New Engineering Contract (Institute of Civil Engineers)**

  A: Priced contract with Activity Schedule
  B: Priced contract with Bills of Quantity
  C: Target contract with Activity Schedule
  D: Target contract with Bills of Quantity
  E: Cost reimbursable contract
  F: Management contract

- **Model Forms of Conditions of Contract for Process Plant**
  (Institution of Chemical Engineers)

  Red Book: Lump sum contracts
  Green book: Reimbursable contracts
  Yellow book: Subcontracts

The ECIA (Engineering Construction Industry Association) has produced a Code of Fair Contracting Practice which is regarded as good practice and encapsulates the ACTIVE Principles. Details can be found under Further Reading at the end of this VEP.

3.1.10 Guidelines for Supplier Selection

The key features of an effective supplier selection process are:

- Supply market intelligence gathering
- Supplier evaluation
- Preparation and issue of tender invitation documents
- Tender evaluation/bid award

Further details of applying an effective supplier selection process are included in ACTIVE VEP 3.2 Supplier Selection.

3.1.11 Guidelines for Contract Monitoring and Measurement

During a the course of a project, companies should monitor the effectiveness of their supply chain contracts against an agreed set of clearly defined, measurable goals.

Companies should seek to measure the overall outcome of a project against clearly defined and measurable criteria. The criteria adopted should reflect the essential success factors that all parties are aiming to achieve.

Clearly established criteria can form the basis of shared reward, while allowing productivity and efficiency levels to be monitored. All parties involved in the process should seek to measure and record the successes and failures of the total project process in order that all involved have the opportunity to share performance outcomes in terms of benefit or loss.

For further details of measuring the effectiveness of the procurement cycle, see ACTIVE VEP 8.2 Contract Monitoring and Measurement.

3.1.12 Guidelines for Payment Arrangements

The key requirements for maintaining a well balanced supply chain are that all parties should fulfil contractual obligations and should make prompt payment when due.

Major client companies and contractors often fail to appreciate the constant cash flow problems faced by smaller suppliers resulting from late or delayed payment for work done. This is often due to slow or bureaucratic account payment processes in large organisations.

Sometimes it may be a deliberate policy to derive advantage at the expense of the smaller supplier. These frustrations can build up significant barriers with suppliers which work against the ACTIVE principles of co-operation and partnership and reinforce adversarial behaviour. Such problems represent a considerable hidden cost to the industry which outweighs the perceived advantages of a tardy payment policy by buyers.

Maintaining payment schedules is an important factor when developing relationships. When disputes arise, the buyer should commit to paying invoices not in dispute. If part of an invoice is in dispute then the accounting process should either allow part payment or be flexible enough to accept credit notes to process the non-disputed amounts. If the buyer requests the supplier to remove finance costs to counter late payments from the contract price, then the buyer must issue payments within the agreed credit period.

To ensure that cash flow can be properly managed, contracts should clearly state the conditions for payment. This should include specific durations for receipt, approval and payment of invoices with the remedies defined for the recovery of financing costs arising from unreasonably late payments.

Performance Bonds and Guarantees can add significant cost to the contract process. A balanced view should therefore be exercised when assessing the need for such guarantees and they should only be requested where considered absolutely essential. If they are required, they should be drafted such that they are clearly understood by all parties and include explicit terms for being called and a finite expiry date.

Retention money is often withheld for reasons other than those for which it was intended under the contract. Delays in releasing retention money adversely affects cash flow, adds cost to the process and works against the principles of co-operation and partnership. Conditions for accrual and release of retention money should be clearly specified within the contract and money should be released promptly when those conditions are met. Where practicable, retention bonds should be encouraged in lieu of retention money.

3.1.13 Guidelines for Resolving Disputes

In most projects, disputes will arise from time to time between the parties in the supply chain. Companies should, however, adopt a 'negotiate first' approach to the resolution of disputes. To maintain co-operative business relationships between parties, all contract documents should include a practical framework for prompt notification of disputes, and a speedy, cost effective method for their resolution.

Further detail on dispute resolution are included in ACTIVE VEP 3.3 Contract Dispute Resolution.

3.1.14 Guidelines for Continuing Relationships

Companies should develop and foster effective industry-wide supply chain relationships within and beyond the immediate contract, by building on learning and experience, to the mutual benefit of all parties. Where appropriate this could result in alliances, partnering or long term supplier arrangements.

One industry perception is that the 'best' contractor is the one to be appointed to the next project and the 'worst' is the one who has just completed the last project. The adversarial nature of contract relationships has led to a situation where client companies return to the 'bottom of the learning curve', presenting no mechanisms for ongoing improvements in the relationships with contractors or suppliers.

Experience with alliance or partnering-type relationships has been mixed. However, in the right circumstances preferred supplier or alliance relationships can bring considerable benefit if they are properly established and managed as business relationships.

Successful long term relationships in the supply chain require appropriate procurement strategies within both client and supplier organisations. Within these relationships the attitude of the buyer, the ongoing performance of the supplier and the degree of alignment between parties, are all critical factors. A successful relationship will not be achieved merely by having a good written contract and rules of engagement: the behaviours of the parties involved are also essential to the development of trust and interdependence.

Workbook Cross References

VEP 1.2.3	Guidelines for Developing and Testing Project Scope
VEP 1.7	Procurement Strategy
VEP 2.1	Project Team Organisation
VEP 3.2	Supplier Selection
VEP 3.3	Contract Dispute Resolution
VEP 4.1	Information Management
VEP 5.2	Risk and Benefit Framework Agreements
VEP 6.2.2	Innovation in the Supply Chain
VEP 7.4.3	Guidelines for specifying functionality
VEP 7.5	Project Handover and Commissioning
VEP 8.2	Contract Monitoring and Measurement

Further Reading

CII SP4. Project Materials Management Handbook.
CII SD-27. Project Materials Management Planning Guide. Research report.
CII EM-6. Tools for Effective Materials Management. Training package
ECIA Code of Fair Contracting Practice
CRINE Guidelines for Alliancing
CRINE Guidelines for Procurement and Purchasing

For CII, CRINE and ECIA contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 3.1 originated with the Procurement Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE VALUE ENHANCING PRACTICE

No. 3.2 SUPPLIER SELECTION

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ACTIVE VALUE ENHANCING PRACTICE

No. 3.2 SUPPLIER SELECTION

Purpose and Benefit

The outcome of projects depends greatly on the quality of supply chain relationships. Sound selection processes are essential for achieving successful relationships which will enhance value on a project.

ACTIVE VEP 3.2 describes the processes for the selection of suppliers of goods and services for capital projects, whether contractors, consultants, sub-contractors or suppliers of equipment. The VEP also includes a section dealing with the selection of potential partners for alliances and other partnering type contracts.

Essential Activities

The selection of suitable suppliers for a capital project is an important activity which must follow a structured process to ensure the best outcome for the project. The basis for supplier selection will have been established in the procurement strategy (see ACTIVE VEP 1.7). The project will benefit from consideration being given to suitably qualified suppliers having the required capability, proven performance and other relevant characteristics which are able to add value to the project. Tenders should be evaluated in a manner which affords all tenderers an equal opportunity to conclude a mutually acceptable contract.

The essential activities required for a sound supplier selection process are:

- Gather intelligence on the supply market
- Evaluate and select potential suppliers, based on qualification criteria, preferred vendors, and compliance with EU directives
- Prepare and issue enquiry documents
- Conduct pre-tender meetings

- Establish tender submission and bid evaluation process
- Award contract
- Select partners where appropriate

The Essential Activities are discussed in more detail in the following Guidelines for Implementation.

Guidelines for Implementation

3.2.1 Guidelines for Gathering Supply Market Intelligence

Sourcing potential tenderers need not be a long process, but selecting the right tenderers to match the particular circumstances is very important. A good commercial/technical strategy should be matched by equally good and suitable contractors. It is always important to consider availability in the supply market and to be aware of new entrants and potential new contractors.

Where the European Union Procurement Directive (90/531/EEC) is applicable, the contractor must be sourced through negotiated, restricted or open procedure via publishing a notice in SOJEC (Supplement to the Official Journal of the European Community). Where the client may wish to operate a pre-qualification procedure, potential contractors must still be sourced via a pre-qualification notice published in SOJEC.

To gather market intelligence buyers should:

- Determine the tenderer qualification criteria to support an identified need. This is mandatory when a contract will be subject to the EU Procurement Directive
- Access corporate memory, for example, in house records of previous performance, or information derived from contact between technical departments of respective companies
- Appoint a 'sector manager' or similar to gain and exchange detailed knowledge (and develop relationships) with suppliers in supply sectors that are strategic to the client
- Seek the advice of others

- Use directories such as Walker or Kelly's Yellow Pages for ready reference
- Consult trade directories, trade journals and trade associations
- Subscribe to a third party database e.g. Achilles
- Where appropriate, advertise to make contacts in a particular supply sector in trade journals, etc.

Buyers are advised not to rely on hearsay.

3.2.2 Guidelines for Supplier Evaluation

Subject to compliance with requirements of the EU Procurement Directive, which takes precedence when applicable, buyers should undertake a process of supplier evaluation which entails:

- Checking suppliers' financial stability e.g. in Dun and Bradstreet
- Checking technical capability
- Reviewing suppliers' current and future workload capacity
- Obtaining references
- Checking relevant quality assurance or third party accreditation
- Reviewing past performance, preferably against measured and benchmarked data
- Relating the number of suppliers being qualified to value and scope of work being considered
- Aiming, in normal circumstances, to identify and pre-qualify only three to five potential tenderers for each discrete need
- Reviewing safety performance and environmental track record

It is important, however, that at this stage buyers do not:

- Make commitments without checking suitability
- Include suppliers with which there is no intention of doing business

3.2.3 Guidelines for Preparation and Issue of Enquiry Documents

This is the process of defining technical requirements using a specification, and translating the selected procurement strategy into a form that is legally acceptable, balancing the contractor and client risks. The enquiry document also specifies the form in which prices are to be submitted for comparative purposes.

Where requirements of EU Procurement Directive is applicable, the tender assessment criteria must be issued with the enquiry documents. This should be considered as good practice for all strategic contracts. In addition, buyers should:

- Be clear and concise
- Set a common tender return date
- Issue documents to all tenderers at the same time
- Ensure that the required tender validity date is specified
- Establish the most suitable terms and conditions of contract
- Establish whether there is a need for guarantees/bonds
- Take account of whole-life costings
- Ensure consistency between technical and commercial requirements
- Use relevant international (ISO), EU standards or British standards
- Avoid quoting trade names/brand names wherever possible
- Identify timescales in terms of start date, completion date and any key milestones
- Encourage vendors, within the enquiry document, to propose alternative technical and commercial solutions
- Avoid infringement of copyright or patent rights
- Define safety and environmental requirements appropriate to the work

3.2.4 Guidelines for Pre-tender Meetings

It is important for all potential contracts that tenderers have a clear understanding of the wok to be undertaken. To ensure that this objective is achieved, where necessary for high risk/high cost work, a pre-tender meeting should be held, preferably with all the tenderers present. Where the nature of the requirement is that innovative solutions are called for, it may be appropriate for the client to hold separate pre-meetings with each tenderer.

It is good practice for buyers to:

- Invite all tenderers to pre-tender meetings
- Convene and chair the meeting themselves
- Arrange for minutes to be taken and distributed as necessary
- Supply the same information to all tenderers
- Issue any clarification or amendments to the enquiry documents formally and at the same time to all tenderers
- Keep records of all queries received and answers provided

- Give tenderers equal opportunity to visit the location of the work
- Ensure that if a tender return date is granted to any tenderer that all tenderers are given the same extension

3.2.5 Guidelines for Tender Submission and Bid Evaluation

Tenders should be opened in a manner which ensures that confidentiality and impartiality toward the bids is maintained. Late tenders should only be accepted in extenuating circumstances. All tender information must be kept confidential.

Tenders should be assessed in accordance with the criteria set out in the enquiry document. This is essential when enquiry documents are subject to the EU Procurement Directive. When no such criteria are stipulated, it is recommended that all tenders as a minimum should be assessed generically to determine the most economically advantageous offer, taking into account (in no particular order):

- Price
- Compliance with the enquiry document
- Completion date
- Technical acceptability
- Aesthetic and functional characteristics
- Suppliers' technical competence and experience
- Suppliers’ in-house capability and dependency on sub-contracts
- Project management competence and availability
- Post completion support and technical assistance including the provision of spare parts
- Total cost of ownership to the buyer taking into account factors such as installation, operational performance, operation, maintenance, power, depreciation, inventory holding cost, usage cost, disposal cost and other lifetime costs
- Capability of the supplier to maintain the subject of the contract

To ensure fair comparison, it is recommended that the assessment of each bid should be structured under the following headings:

- Economic/risk
- Commercial
- Technical
- Plant/product performance
- Contract programme
- Safety

- Quality assurance
- Management structure
- Environmental impact

A common form of weighting should be used for each tender to ensure consistency of assessment. This weighting should preferably be in the form of a monetary value based on the cost or savings to the buyer of the effect of differences in the tender from the enquiry document requirements.

When tenders are received they should first be subject to an initial tender assessment with the object of developing a shortlist or establishing a preferred tenderer as the case may be. It is recommended that a shortlist should comprise two or three tenderers maximum.

Using the criteria set out above the initial assessment criteria should be based on the provisional total cost of ownership. This is based on the sum of:

The tender price (price stated in the tender)
plus Estimated cost/savings of differences in the tender from the enquiry document
plus The provisional assessment of lifetime operating costs

Where suppliers have offered alternatives, these should be assessed in the same way as the main offer.

When the shortlist or preferred tenderer has been established and the selected tenderer(s) are notified, it is good practice at the same time to advise those who have not been selected. Normally tenders that have not been shortlisted will be advised that their bids will not be taken any further. However, it may be agreed at the outset that it will be in all parties' interests that bids which have not been shortlisted are 'retained on hold' rather than being deemed unsuccessful. This will maintain the opportunity to perhaps add other bids to the shortlist in the event that the discussions with those shortlisted prove to be unsuccessful.

When the shortlist or preferred tenderer has been defined, the second stage of tender assessment should be undertaken to establish further clarity on the scope of supply being offered, and the commercial terms of each of the shortlisted tender.

The aim of the second stage is threefold, namely:

- To establish the total cost of ownership to the client for each bid based on final tender price + final estimated cost/savings of deviations from the enquiry document + value of final assessment of lifetime operating costs

- To achieve complete understanding between the buyer and each tenderer to establish an acceptable basis upon which a contract could be contractually concluded between the parties, plus its associated contract price, if the tender is selected

- To undertake final negotiations and optimisation of the respective bids, or bid in the case of a preferred tenderer, in order to establish the appropriate allocation of risk/reward for both parties which should be commensurate with the nature of the work being undertaken

This second stage could involve the use of formal questionnaires to record and agree the resolution, or otherwise, of each identified difference between each tender and the enquiry documents. Part of this process would entail holding formal meetings with shortlisted tenderers to clarify and reach agreement on the resolution of such queries. If questionnaires are not used, detailed meetings are required to clarify differences with precise minutes recording the agreements reached.

During this process, the buyer should:

- Word questions clearly and unambiguously
- Seek yes/no answers
- Reference the relevant clause in the enquiry document or tender for which clarification is being sought
- Obtain written confirmation of any agreements agreed verbally
- Analyse responses from the vendor with the same thoroughness as the original tender
- Avoid questions which simply ask for confirmation that the buyer's enquiry document will be complied with
- Avoid supplementary questions which detract from the clarity of the original query
- Continue to maintain confidentiality at all times

If a two-stage tendering strategy is being used then the assessment process should be adapted accordingly, but it is recommended that the initial assessment stage should be used to select tenderers who are to receive the full enquiry documents against which a final bid is to be submitted.

3.2.6 Guidelines for Contract Award

Following the selection of the tenderer as described above an acceptance letter must be issued. Unless there are exceptionally extenuating circumstances a Letter of Intent should not be used. If a Letter of Intent is unavoidable due to outstanding issues not being resolved then:

- Allocate a specific contract number
- Define clearly the description and limit of the work being initiated
- Define the conditions of contract that are applicable
- Define the limit of financial liability being entered into
- Define the programme and resources for the work involved
- Define the action in the event of cancellation

It should be noted that the acceptance letter may be in the form of an offer to accept a quotation, a letter accepting a tender, or, under certain forms of contract, an agreement signed between the parties. Whichever is the case, it is advisable to:

- Keep acceptance letters simple and uncomplicated
- Ensure that in the event of an offer being made against a quotation that there is complete and unambiguous acceptance of the offer
- Ensure that all the agreed differences between the original enquiry document and the tender are listed and referenced
- Show the final agreed commercial terms, including the price its make-up
- Clearly identify the agreed scope of work and programme

It is not advised to include any correspondence or data in the acceptance letter that is not relevant to the contract. Only data which clarifies and signifies agreed deviations and differences between the enquiry document and the tender should be included. A typical example of the core of an acceptance letter could be:

> "We are pleased to advise you that we hereby accept your tender dated .... as amplified and amended by the correspondence contained in Appendix A hereto and the questionnaires contained in Appendix B for the supply of the ....
>
> The accepted Contract Price is .... as set out in Appendix C attached hereto
>
> The Contract Completion date is .... as per ....
>
> The Conditions of Contract are ....
>
> The Engineer/Purchaser's Representative/Project Manager will be……………………
>
> Applications for payment are to be made to ....
>
> Please acknowledge receipt of this letter by ....

3.2.7 Guidelines for Partner Selection

The choice of partner, or partners, is the most important decision to be made when setting up any type of project partnering arrangement, whether this be an alliance relationship or a risk and benefit framework agreement. Experience has shown that lack of compatibility between partners is the most common cause of failure.

When establishing an alliance or partnership, in addition to the normal processes for supplier selection, it is important that the following factors are also considered. In addition, since partnering implies a reciprocal relationship, it is important for contractors or suppliers to go through a similar process on their part by selecting the clients with which they will enter into partnerships.

Key factors for consideration are:

- The existence of a strategic congruence. The participating companies must have coincident or complementary business objectives and a similar, or adaptable, cultural attitude. A deep alignment of goals is necessary for success

- Top level corporate commitment to the partnership within the participating companies is essential

- Selecting the ‘right’ people is essential for success. Care is needed in selecting the members of the teams involved. Since team changes can and do occur during the life of a project, the pervading cultures of participating companies must be compatible

- It is necessary for all parties to have confidence in each other to develop a high level of mutual trust

- A good track record between participating companies will greatly facilitate a partnership or alliance. However, any track record needs to be evaluated in the context of the contemporary circumstances which applied, and should not be used to avoid or short circuit an evaluation process

- The team evaluating a potential partner should develop a full profile of the company, including commercial and financial performance, organisational relationships, ethos and culture, staff development, and technical performance

- The capabilities and resources of the potential partner must be evaluated. The company must be able to contribute positively to the partnership beyond the supply of goods and services

- Potential partners should be able to provide access to other customers to enable information on similar arrangements to be gathered

- An understanding of the benefits the potential partner expects from the partnership should be established

- On the basis of a full assessment, selection should be based on the best total value offered, and not solely on the lowest cost

- If the arrangement is perceived as exclusive and long term, the impact on other players in the market needs to be assessed together with the ability of the prospective partner to change and adapt as the business environment changes

Workbook Cross References

VEP 1.7	Procurement Strategy
VEP 2.1.1	Guidelines for Selection of Contributing Organisations
VEP 3.1	Procurement Cycle Management
VEP 5.2	Risk and Benefit Framework Agreements

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 3.2 originated with the Procurement Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE VALUE ENHANCING PRACTICE

No. 3.3 CONTRACT DISPUTE RESOLUTION

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ACTIVE VALUE ENHANCING PRACTICE

No. 3.3 CONTRACT DISPUTE RESOLUTION

Purpose and Benefit

Although contract disputes should and often can be avoided, when they do arise on projects all parties should adopt a 'negotiate first' approach to their resolution. To maintain co-operative business relationships between parties, all contract documents should include a practical framework for prompt notification of disputes, and a speedy, cost effective method for their resolution which will be to the benefit of all concerned.

Essential Activities

In most projects, disputes arise from time to time between the parties in the supply chain. These disputes generally result from 'pressure points' arising from poor communications, lack of clarity, changes in scope, inadequate performance etc. Many of these pressure points can be avoided by close attention at the outset of the project, but even in the best contracts, disputes can still arise. It is important, therefore, that appropriate procedures for the resolution of disputes are defined and agreed before the contract is awarded.

The key to a successful procurement process is teamwork between buyers and sellers. A teamwork approach to problem solving helps to break down the 'blame culture' and engenders a positive approach to sorting out differences between parties. In a team environment, many potential disputes can be resolved informally without resorting to formal procedures.

Dispute resolution has traditionally taken the form of either arbitration or litigation. As these methods are ‘backward looking’ and focus necessarily on past actions, they tend to lead to adversarial behaviours by the parties involved, resulting in a breakdown in relationships and significant expenditure. The Arbitration Act 1996 and the radical reforms of the civil justice system proposed by Lord Woolf in his report: ‘Access to Justice’ (HMSO August 1996), seek to address some of the criticisms that have been levelled at the traditional processes.

However, in recent years alternative methods have been developed known as ADR (Alternative Dispute Resolution) methods which are often more beneficial to all parties. These methods tend to concentrate on the parties' interests, an approach which is not necessarily the same as obtaining a result in accordance with parties' merits.

Examples of ADR methods include:

- Drafting contracts
- Negotiations
- Partnering and alliancing
- Mediation
- MedArb
- Disputes Review Board
- Expert determination
- Mini-trial
- Rent-a-Judge
- Adjudication

As Essential Activities in dispute resolution, the ADR methods are discussed in more detail in the following Guidelines for Implementation.

Guidelines for Implementation

3.3.1 Guidelines for Contract Drafting

The contract can, if clearly drafted, produce a framework for dispute avoidance, but this is often difficult in practice. Every effort should be made at the contract drafting stage to express with great clarity, certainty and transparency, the intentions of the contracting parties, as this framework will provide valuable assistance should disputes arise.

3.3.2 Guidelines for Negotiations

Disputes will continue to be resolved through negotiation. Negotiations may be of the traditional unstructured variety, structured, or facilitated by a third party facilitator. The key to success lies is creating the right climate for negotiations.

3.3.3 Guidelines for Partnering and Alliancing

A teamwork approach through partnering or alliancing contracts provides a climate which should help to avoid, minimise and manage disputes. While such contracts do not necessarily provide a specific means for dispute resolution, the opportunity for mutual trust to develop should encourage a 'negotiate first fight later' approach.

3.3.4 Guidelines for Mediation

This process focuses on the parties' interests rather than their strict legal rights. It is the most widely favoured ADR technique, in which a neutral mediator is appointed by the parties to investigate the causes of the dispute and to facilitate an amicable settlement. It is voluntary, non-binding (at least and until a settlement is reached and a binding agreement has been drawn up and executed), and free of procedural formalities. It is also confidential, subject to the divulgence of information only as permitted by the parties respectively and without prejudice to the rights and recourses of the parties, in the event that the process ultimately proves unsuccessful. Each party to the dispute is represented by an individual (ideally a chief executive in the case of a limited company) who has authority to settle on behalf of that party, often (although not necessarily) accompanied by a solicitor.

At the core of this process is the mediator. The role of the mediator has been defined as:

> "Unlike the arbitrator or the judge, the mediator has no authority to make a binding decision. For that matter, the mediator has no authority to make any sort of determination. The mediator's role is purely facilitative. He helps bring the parties together by listening, counselling, guiding, suggesting and persuading the parties to come to terms. As a neutral, the mediator is an agent for neither of the parties, a member of the negotiating team. He is an adjunct to negotiations that the parties might carry on directly."

In selecting a mediator the criteria or factors to be considered include whether the candidate is impartial, objective, flexible, articulate, persuasive, creative, imaginative, respected in the community, trustworthy, reliable, and a good listener.

The key to successful mediation is positive discussion. For that to be achieved it is essential that each party is confident that the other side is represented by someone with authority to settle on behalf of that party. Further, it is preferable that the party's representative has not been personally involved in the matter giving rise to the dispute, in order to ensure that that person's approach to settlement is not influenced by previous decisions or personal sentiments.

After the mediator is appointed, and prior to the mediation meeting beginning, the mediator will usually invite each party to make a written submission of its position. This may take the form of traditional pleadings or it may be an agreed package of documents. Whichever form it takes, the purpose is to allow the mediator to understand the background of the dispute prior to meeting the parties. Although there is no hard and fast rule as to how the mediation meetings are to proceed, generally speaking the mediator will begin by explaining the process and his/her role and will then call upon each of the parties to briefly explain that party' position.

Following introductions and oral representations in the presence of all the parties, the mediator will proceed to a series of private meetings which each of the parties, often referred to as caucusing, in which he first attempts to ascertain the true position and interests of the party in respect of the dispute and then to clarify the issues separating the parties and possible areas of compromise, Throughout, it is essential that the mediator remains neutral and supports the position of neither party, nor expresses any opinion that may impact on the atmosphere of trust. Further, to the extent possible, the period of time spent by the mediator with each party should be equal and measured.

The process is intended to be flexible and can be varied to suit the needs of the parties involved. Experience suggests that within a relatively short period of time the dispute will either be resolved or one or both of the parties will decide to withdraw. Alternatively, the parties may ask for a written report of the mediator's views as to the terms of a reasonable settlement, which report may take into account the parties' respective interests or not. In the absence of agreement by the parties to pursue the process at a later date, the mediator's role will then come to an end. That is unless the parties have agreed to proceed by way of MedArb which, as its name suggests, is a cross between mediation and arbitration, as described below.

3.3.5 Guidelines for MedArb

MedArb is intended, at least in theory, to work as follows. The parties agree at the commencement of the mediation that if they cannot resolve their dispute through the mediation process, the neutral mediator shall take on the function of an arbitrator and shall, in that capacity, render a binding award. The theory is that if the parties know that if they are unable to come to a settlement one will be imposed on them then they will approach the settlement process with greater enthusiasm and purpose.

It remains to be seen however, whether the process can have any widespread, practical application. Knowing that the mediator might subsequently act as an arbitrator might encourage the parties to be less forthcoming. Equally possible, the neutral mediator might, inadvertently, move prematurely to arbitration before allowing the mediation to run its course and then render his decision, influenced more by the information amassed in confidence during the course of the mediation than by the evidence adduced under the stricter rules of arbitration.

Given the difficulties with this process it is advised to maintain lawyers' involvement to protect each party's interests.

3.3.6 Guidelines for Disputes Review Board

Increasingly popular in the construction industry is the resolution of disputes by reference to a panel of experts, or a Disputes Review Board (DRB). Unlike other ADR processes, the DRB concept was created by and for the construction industry. Furthermore, the DRB process attempts to resolve the disputes during the construction process, often 'on site'.

Although there exists a number of different DRB models, the basic concept is as follows. Typically, the board is composed of three individuals, one selected by the employer, one selected by the contractor and the third, who generally acts as chairman, by the two appointees, all with expertise in the type of construction involved but not necessarily in the same field, such that each will act independently of the contracting parties and of one another. For example, a DRB for a hydro-electric project may include a geologist, a hydrologist, and a civil engineer.

Unlike the composition of an arbitration board of three members, all of the DRB members must be agreed by both the employer and the contractor with the result that the parties will regard the board as being both qualified and unbiased and will, therefore, have greater willingness to submit their dispute for resolution and to accept the board's decision.

Further distinguishing features of the DRB are that its creation is generally provided for in the contract documents, and that it is involved in the project from its outset, being kept informed of the progress of the works by way of periodic site meetings, reports etc., regardless of whether there is a particular dispute requiring resolution.

In the event of a dispute, each party is afforded an opportunity to present to the board, in the presence of the other, information it thinks relevant to the dispute, If necessary, the board can conduct its own investigation. In no circumstances, however, can the board communicate with one party in the absence of the other. Within a short period the board submits its reasoned findings and recommendations for resolution of the dispute.

Even when the decisions of the DRB are not binding, they are nonetheless generally followed, particularly so when the agreement to use DRB provides (as it usually does) that the DRB's recommendations can be adduced into evidence in any subsequent arbitration or litigation. Alternatively, the parties can agree that the decision of the DRB be a binding interim determination which may become final if neither party sends a notice of opposition within a prescribed period.

Admittedly, not all construction projects can justify the costs associated with the appointment of three experts, their meetings and keeping them informed of the project's progress. Where the construction is not considered overly complex, the role of the DRB can be assigned to one expert who may adopt the title of dispute resolution adviser or adjudicator, whose decision is to be implemented at once even if subsequently overturned by the courts. An alternative is to appoint an arbitrator after practical completion of the project, as envisaged in the Housing Grants, Construction and Regeneration Act 1996.

3.3.7 Guidelines for Expert Determination

In this ADR method, an individual or a panel is charged with the making of binding decisions on the dispute in question. Such an alternative might well be suitable for disputes that are technical in nature. Unless otherwise stated, case law has determined that an expert's decision will be final and binding and incapable of being challenged by a dissatisfied party unless there has been fraud, partiality or mistake.

3.3.8 Guidelines for Mini-Trial

This is a less common form of ADR process at present. It is a process which focuses on the rights of each of the parties in contrast to the interests-based approach that underlies mediation. It consists of a tribunal, normally comprised of a neutral (usually an expert in the field concerned) and a representative of each party (preferably a senior management figure with authority to make binding decisions who has not been personally involved in the facts leading up to the dispute). The tribunal hears perhaps one key witness per side and the parties' respective legal representatives who are given a strictly limited time in which to set up the main points of each party's case.

The role of the neutral is to ask questions following each presentation with a view to promoting a better understanding of that party's position and, where requested by the parties, to provide an opinion as to the merits of the case on a privileged and non-binding basis and facilitate further settlement discussions between them.

The particular advantage of this process is that it allows the senior executive of each party to supplement the legal advice likely to have been received prior to the process, with judgments personally formed on the basis of the representations made and the neutral's input. Further, it allows the senior executives to play a greater role in the settlement negotiations which ensue. The technique is especially suitable for disputes where the parties have reached an impasse because of emotional barriers.

This technique is not, however, without certain disadvantages. Chief among these are the costs associated with the process which can be substantially greater than those of traditional ‘without prejudice’ negotiations; the high investment of time and energy by senior personnel; the relatively superficial presentation, and, in turn, examination of the issues; and last, but not least, the disclosure of each party's position and its weaknesses which affords that party the opportunity to redress the shortcomings of its position in the event that the dispute eventually proceeds to another forum. Further, the process is probably unsuitable for a dispute which questions on the credibility of each party's evidence or one which turns on a pure question of law.

3.3.8 Guidelines for Rent-a-Judge

In Rent-a-Judge, the parties do just that. They make their submissions to an appointed neutral who, after due consideration, publishes his opinion as to the likely outcome of the dispute should it proceed to trial, although that opinion may not be admitted into evidence. Where the matters central to the dispute are technical as opposed to legal, recourse may be made to the process of expert appraisal.

3.3.9 Guidelines for Adjudication

The idea behind this method of ADR is that an adjudicator can make a speedy decision which must be complied with but which will, should one party be dissatisfied, be open to review in formal proceedings in due course. Some standard forms of contract have incorporated adjudication provisions for many years.

The Housing Grants, Construction and Regeneration Act 1996 creates a statutory right for parties to have disputes under the contract referred to adjudication, under a procedure complying with the requirements of Section 108. It is worth noting that there is no restriction in the type of dispute that can be adjudicated.

Workbook Cross References

VEP 1.7	Procurement Strategy
VEP 5.2	Risk and Benefit Framework Agreements

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 3.3 originated with the Procurement Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE PRINCIPLE 4

EFFECTIVE INFORMATION MANAGEMENT AND COMMUNICATION

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ACTIVE PRINCIPLE 4

EFFECTIVE INFORMATION MANAGEMENT AND COMMUNICATION

Capital projects require the generation and handling of large amounts of information, much of which is required subsequently in the operation and maintenance of the facility. The effective management of information during the life cycle of a project will do much to improve communications and increase project performance in terms of both time and cost.

During project execution, unnecessary duplication and regeneration of information should be avoided which not only saves time and resources but reduces opportunities for errors. Information must be provided in a timely way to project participants, relevant senior managers and others who need to know, thereby improving communications within the supply chain. The requirements for project handover to operations and maintenance at the time of project completion should be established at the outset of the project, covering information content, format and timing. The compilation of this information must be managed throughout the execution of the project to ensure handover with the minimum of effort and delay.

Key activities to achieve effective management of information include:

- Early mobilisation of appropriate personnel from client and contractor to agree the information requirements of the project
- Preparing a project information management strategy at an early stage of the project
- Communicating that strategy to everyone involved
- Using the most appropriate information technologies to generate, transmit, index, store and communicate documents and data
- Agreement throughout the supply chain on essential information and documentation requirements, identifying responsible parties and timing requirements.
- Avoiding unnecessary documentation and needless circulation
- Presenting information in a concise and clear way to users at each project stage

- Collating information which can be handed over and transferred into operations and maintenance systems with maximum efficiency

Supporting Value Enhancing Practices:

VEP 4.1 Information Management

ACTIVE VALUE ENHANCING PRACTICE

No. 4.1 INFORMATION MANAGEMENT

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ACTIVE VALUE ENHANCING PRACTICE

No. 4.1 INFORMATION MANAGEMENT

Purpose and Benefit

ACTIVE VEP 4.1 addresses the effective generation and management of information during the execution of a project, and its delivery to information systems for use throughout the project life cycle. The life cycle includes project definition, design, procurement, construction, commissioning, operation, maintenance, reconfiguration, decommissioning and demolition.

These phases of the project life cycle involve multiple organisations, systems and interfaces which traditionally have required expensive translation or re-entry of data to pass information across these boundaries. Avoiding unnecessary duplication or regeneration of data for different purposes or at different stages of the project life cycle will provide significant cost savings.

Essential Activities

The effective management of information throughout the life cycle of a project consists of the following Essential Activities:

- Prepare and implement a project information management strategy.
- Establish the information requirements for each phase of the project and the data to be transferred between phases. Where appropriate to the transfer of information between project phases, develop separate data handover guides.
- Define the data formats. Where possible, common systems (word processing, 3D CAD plant design etc.) should be used.
- Critically examine requests for documentation availability on any proposed information system to ensure that the need is genuine.
- Establish a set of 'life cycle codes' which define the use, retention and maintenance requirements for information. These codes should be

allocated by the originator of the information, ensuring that only necessary information is retained and updated.

- Establish the locations where project information is to be retained, along with mechanisms to provide rapid access to it.

Further details on the Essential Activities are described in the following Guidelines for Implementation.

Guidelines for Implementation

4.1.1 Guidelines for Preparing an Information Management Strategy

A strategy should be developed at the outset of the project to cover all aspects of effective generation, management and communication of information. The strategy should include defining the responsibilities and processes involved in creating and managing the information, and the preparation for handover to life cycle information systems. Refer to ACTIVE VEP 1.6 for details on the preparation of an information management strategy.

4.1.2 Guidelines for Establishing Information Requirements

The information requirements for each phase of the project and the data to be transferred between project phases must be determined as early as possible, and should be refined as the project expands. When this evaluation is made, consider the availability of information (extent, format, etc.) at that stage, and the information requirements at the end point, then work from both ends to define the requirements of each phase.

Involve all appropriate project participants in establishing the requirements for each phase, including contractors, fabricators, suppliers, operators and regulatory bodies. The participants should:

- Agree a common approach
- Avoid information incompatibility or management problems
- Identify information created at a given stage of the life cycle which has a use beyond that stage or outside the group of users, thereby avoiding the need to recreate data

Where appropriate to the transfer of information between project phases, separate data handover guides should be developed.

4.1.3 Guidelines for Defining Data Formats

Project participants should agree that core applications and systems will be used wherever possible, for example for word processing and 3D CAD plant design. These must include the same versions of software and any conversion products to be used to translate between dissimilar systems. This should apply not only to desk top products but also to CAD systems, planning and project control software, intelligent schematics and data exchange standards for proprietary database systems.

4.1.4 Guidelines for Specifying Information Requirements

The information required from all project participants should be defined within the enquiry and contractual documentation. This should be in accordance with requirements established at the start of the project and maintained as a live document. Failure to comply with the requirements should invoke penalties equivalent to the cost of generating the required information.

An assessment should be made of whether full information compatibility is sufficiently important to justify restricting the range of eligible suppliers of services or equipment.

4.1.5 Guidelines for Reducing Documentation

There is a misconception on many projects that the generation of large volumes of information must be of value. However, information has a highly variable value: some is essential, but much is of no value and serves only to obscure truly valuable information. Furthermore, information has different values for different people and values can decline or appreciate with time. The belief by clients and suppliers that increasing volumes of information must be beneficial leads to costly and wasteful practices. Clients and contractors demand frequent and detailed reports which are rarely read, while vendors frequently generate documentation to give an illusion of progress.

Removal of unnecessary documentation is a relatively simple way to reduce costs in the supply chain. Before any document is demanded, the value it will add must first be questioned, all requests for documentation being critically reviewed to ensure that the documentation is actually required.

The drafting of contracts must be simplified; clarity will often be improved by eliminating many of the voluminous schedules and appendices. Similarly much duplication of information, often giving rise to inconsistencies and errors, can be removed. The advent of the photocopier has facilitated the generation of vast quantities of paper sent to everyone: much of it remains unread.

Electronic systems present other problems but have started to address the issue of selectivity of information. Although there is often a high initial cost in setting up information handling and transfer on a project, there can be considerable benefit in speed and ease of use in accessing value-adding information through electronic networking between clients, contractors and suppliers.

Reducing the quantity of documents in circulation not only reduces the costs associated with producing the document but also the costs incurred by the recipient reviewing and processing it. Changing the requirements for documentation is relatively straightforward and has a high potential to reduce cost.

Projects need an effective document management system which should ideally be available for access by all those in the supply chain who 'need to know'. This may not always be possible to achieve and there will always be specific information which cannot and should not be shared in this way, but an open system will greatly assist good communications on a project. The availability of electronic groupware systems and extranet links makes this type of information management more feasible.

Non-operational documentation is often requested in 'as-built' form, which is a costly, time consuming and potentially error-prone activity. The use of photogrammetry, in conjunction with the 3D CAD model to produce an as-built model of the finished plant, can make such documentation unnecessary.

4.1.6 Guidelines for Establishing Life Cycle Codes

The entire life cycle of a project involves vast quantities of documentation. To ensure this documentation is correctly maintained, available when needed, and deleted when no longer required, a life cycle coding system should be established at the start of the project. These codes should be allocated by the originator of the information and should become the responsibility of the document owner in each phase of the life cycle.

4.1.7 Guidelines for Establishing Information Locations

In order to reduce duplication and the amount of information passing between phases and participants, consideration should be given to using the originators of information, for example suppliers and contractors, as information retainers. Where information is to be retained, mechanisms must established for providing rapid access to it.

Workbook Cross References

VEP 1.6	Information Management Strategy
VEP 2.1.9	Guidelines for Knowledge Management
VEP 2.1.11	Guidelines for Project Communication
VEP 2.1.15	Guidelines for Establishing a Communications Plan
VEP 7.1.3	Guidelines for Reporting
VEP 7.2.3	Guidelines for Communication
VEP 7.5	Project Handover and Commissioning

Further Reading

CII SD37.	Data Integration Strategies in Construction. Research report.
CII 20-3.	Achieving an Integrated Data Environment: A Strategic Initiative. Research summary.
CII 106-1.	3D CAD Link. Research summary.
ECI TF 15/2.	Data Transfer and EDI Vol. I: An Introduction (ISBN 1873844263). Report.
ECI TF 15/3.	Data Transfer and EDI Vol. II: EDI and STEP (ISBN 1873844247). Report.
CII IR125-2.	Information Management Impacts: Payback for Investments. Software Tool.
CII IR105-2.	Communication Project Assessment Tool (COMPASS): User's Guide. Software Tool.
CII RR105-11.	An Assessment Tool for Improving Project Team Communication. Research report.

For CII and ECI contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE Best Practice No. 5 originated with the Information Management Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE PRINCIPLE 5

EFFECTIVE PROJECT RISK MANAGEMENT

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ACTIVE PRINCIPLE 5

EFFECTIVE PROJECT RISK MANAGEMENT

The process of project risk management is a structured way of managing exposure to risk throughout the life of the project and beyond. These risks are not only technical risks but also include commercial and human risks. Uncertainty at the outset of any investment is usually high and hence the adoption of a managed process to identify, understand and analyse the likely risks before they occur will allow for their subsequent mitigation and management throughout the implementation of the project.

Risk assessment considers both the likelihood of events occurring and the possible consequences. If the identified risks are unacceptable, ways of mitigating or reducing those risks can be sought and contingency plans made. In some cases, risks can be eliminated completely while other risks are completely external to the project, presenting little scope for reduction. Since the risk profile will change with time as the project develops, reassessment of risk should continue throughout the life of the project as part of the risk management process.

Within contractual relationships on the project the aim should be for specific risks to be managed by the party best equipped to deal with that risk at least cost. The potential benefits available to each of the parties in a contractual relationship should reflect the degree of risk borne by each party. Proper management of risk in supply chain relationships should encourage and reward effective innovation and performance.

Key elements of a project risk management process should include:

- Establishing at the outset of the project an efficient risk management programme to monitor and manage risks throughout the life of the project
- Ensuring personnel are trained to identify key risk areas as the project proceeds
- Identifying all known risks at an early stage of the project and establishing a risk register describing the nature of the risk, probability of occurrence and impact should it occur, along with methods for its elimination, mitigation or management.
- Having in place a process for monitoring, updating and reviewing the risk register throughout the life of the project

- Within supply chain relationships, identifying and agreeing the risks to be borne by each party balanced against the potential benefits. The risk/benefit balance should be reflected formally in the contracts between the parties

Supporting Value Enhancing Practices:

VEP 5.1	Project Risk Management
VEP 5.2	Risk and Benefit Framework Agreements

ACTIVE VALUE ENHANCING PRACTICE

No. 5.1 PROJECT RISK MANAGEMENT

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ACTIVE VALUE ENHANCING PRACTICE

No. 5.1 PROJECT RISK MANAGEMENT

Purpose and Benefit

ACTIVE VEP 5.1 addresses project risk management as the systematic process of reducing exposure to risk by identifying, understanding, analysing and managing the uncertainty in a project.

Project risk management identifies key areas of risk, the likelihood of an event occurring, and estimates the possible consequences. It may therefore be used to direct effort to minimise such consequences. Risk management is frequently applied continuously throughout the life of a project as a method of limiting cost and time overruns, and is used prescriptively as a project management methodology.

Essential Activities

The Essential Activities of project risk management are:

- **Setting objectives**

  Formulate and implement an efficient risk management programme which is consistent with corporate objectives

- **Risk analysis**

  Identify and describe risks to gain awareness of the risk type; the conditions and probability of the risks occurring must be established; and interdependent relationships which may affect project objectives must be evaluated

Risk handling

Prepare a method of response to reduce or eliminate the risk. This entails the formulation of a risk register and management plan to enable the proactive and continuous control of risk and uncertainty. Risk handling involves specific risk response strategies for the transfer, mitigation, allocation or acceptance of risks to reduce overall project uncertainty

Risk monitoring

Monitor the risk environment throughout the project life cycle, and measure the effectiveness of risk response strategies

The Essential Activities are described in more detail in the following Guidelines for Implementation, plus supporting Attachment.

Guidelines for Implementation

5.1 Guidelines for Setting Objectives

Setting objectives is necessary to establish the overall framework for risk management, the implementation of which must be supported from the top level of the organisation (corporate management).

- Clear project procedures must be established for risk management (risk identification, analysis, handling and monitoring including recording systems and feedback and feedforward controls).
- Spread risk awareness within the project and remove barriers to implementation at all levels in the project organisation, including suppliers.
- Make specialist resources and tools available and/or implement training and education as needed.

5.1.2 Guidelines for Risk Identification

Risk identification is the first step in the risk management process and entails the identification, description and understanding of the risks.

Sources of risk include:

- External influences
- Equipment characteristics
- Contractors' and suppliers' performance
- Complexity of the organisation
- Human error and poor communication
- Safety, health and environmental hazards

The process of risk identification depends on the ability of the management team to interpret the available information, and to appreciate all of the factors creating uncertainty. The identification of risk depends on the process of perception. Care must be exercised as perceived risks may not necessarily be actual risks.

Methods of risk identification include:

Use of check lists

Check sheets which act as guides and provide lists of potential sources of project risk. An example is included in Attachment 5.1-A.

Facilitated workshops

To provide a forum for capturing the experience and interactive response from the project team and promote awareness between the stakeholders. Workshops also encourage collaboration and creativity.

Programme analysis

To establish the project's critical path, identifying resource or interface constraints.

Documented information

Using records of previous experience to predict future trends.

Organisation mapping

To establish the risks inherent within the organisation by examining levels of control, autonomy and relationships.

5.1.3 Guidelines for Risk Analysis

Risk analysis is a structured process, based on calculation, which is aimed at quantifying the impact of risk. Risk impact can be measured against the main project objectives (time, cost, performance, and service). Effective risk management should be considered as a balance between the interpretation of analytical results and sound judgement based on experience and knowledge.

A number of techniques have been developed for risk analysis, including:

Sensitivity analysis

Analysis of the effects on project outcome by changing a variable or combination of variables.

Probability analysis

Identification of ranges of outcomes through the use of cumulative probability graphs and percentile tables. Monte Carlo simulation is a typical method.

Decision trees

Assigning probabilities to courses of action and graphically presenting alternative courses and future possibilities.

Simulation

Modelling a system to provide a means of predicting reaction to changes in variables.

Utility theory

The application of utility functions to formalise the manager's attitude to risk.

Regression

Determining the relationship between variables to enable the behaviour of a dependent variable to be forecast.

It should be noted that there is often insufficient objective data to be able to carry out a meaningful risk analysis and in these cases subjective assessments will be necessary. Care must be exercised as subjective assessments can be biased, depending on the risk attitude of the individual or group.

5.1.4 Guidelines for Risk Handling

Risk handling involves specific risk response strategies for the avoidance, mitigation, allocation or acceptance of risks to reduce overall project uncertainty. In preparation for reacting to risks, a management plan must be formulated which when implemented will reduce or eliminate the specific risk. Risk management action plans should be established with clear lines of authority to ensure these actions are effectively implemented.

Risk responses may be classified as:

Avoidance or reduction

Alternative action is required, including, if necessary, changes to the project plan or implementation strategy. Preventative measures should be identified and additional information sought for an improved understanding of the risk.

Transfer or allocation

Transfer or allocate the risk to the party who is best able to quantify and manage the risk.

Retention

Acceptance of the risk accompanied by determining the best measures to control and manage the risk. Contingency planning is necessary for these circumstances.

5.1.5Guidelines for Risk Monitoring

Risk controls should be established to ensure the ongoing management of risk. A continuous review is required of identified project risks and their significance, the effectiveness of risk response strategies, and regular updating of contingency plans.

The outcome of the risk management process must always be compared with, and remain consistent with, the main project objectives.

Workbook Cross References

VEP 1.4	Value Analysis
VEP 5.2	Risk and Benefit Framework Agreements
VEP 6.2.4	Evaluating and Selecting Improvement Options

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 5.1 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

5.1-A Check list for Primary Sources of Project Risk

ACTIVE VALUE ENHANCING PRACTICE

No. 5.1 PROJECT RISK MANAGEMENT

ATTACHMENT 5.1-A

CHECK LIST FOR SOURCES OF PROJECT RISK

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ATTACHMENT 5.1-A
CHECK LIST FOR SOURCES OF PROJECT RISK

	Not Considered as risk	Potential Risk Category		
		1	2	3
Physical Loss or damage by fire, flood, accident, landslide				
Environmental Ecological damage, pollution, waste treatment Public Enquiry				
Design New technology, innovative applications, reliability, safety Detail, precision and appropriateness of specifications Design risks arising from surveys, investigations Likelihood of change Interaction of design with method of construction				
Logistics Loss or damage in the transportation of materials and equipment Availability of specialised resources, expertise, designers, contractors, suppliers, plant, scarce construction skills, materials Access and communications Organisation interfaces				
Financial Availability of funds, adequacy of insurance Adequate provision of cash flow Losses due to default of contractors, suppliers Exchange rate fluctuations, inflation Taxation				
Legal Liability for acts of others, direct liabilities Local law, legal differences between home country and home countries of suppliers				
Political Political risks in countries of owner and suppliers, contractors, war, revolution, changes in law				
Construction Feasibility of construction methods, safety Industrial relations Extent of change Climate Quality and availability of management and supervisors				
Operational Fluctuation in market demand Maintenance needs Fitness for purpose Safety of operation				

Risk Categories: **1. Considered to be a significant risk factor** **2. Considered to be a risk factor** **3. Considered to be a minor risk**

Source: Perry and Hayes 1985

ACTIVE VALUE ENHANCING PRACTICE

No. 5.2 RISK AND BENEFIT FRAMEWORK AGREEMENTS

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ACTIVE VALUE ENHANCING PRACTICE

No. 5.2 RISK AND BENEFIT FRAMEWORK AGREEMENTS

Purpose and Benefit

For capital projects it is important to ensure that within contractual relationships specific risks are managed by the party best equipped to deal with each risk at least cost, and that potential benefits reflect the degree of risk borne by each party. Proper management of risk in this way will encourage and reward effective innovation and enhance project performance.

Adopting a risk and benefit framework agreement is an effective way of aligning the objectives of the supply chain with the objectives of a project as a whole. Sharing risks and benefits focuses all parties on the primary goals of the project and, if structured correctly, a risk and benefit framework offers a self financing method of achieving these primary goals. In particular, the approach described here recognises the diverse nature of companies within the supply chain and suggests a framework for agreements capable of extending participation beyond the limit where full alliancing/partnering agreements are applicable.

This ACTIVE VEP describes how the use of Risk and Benefit Framework Agreements on projects can achieve better management of risk to the benefit of all parties.

Essential Activities

Assessment and management of risk is an essential part of project management. The transferring or sharing of risk within the supply chain with those parties most capable of influencing or mitigating the risk increases the likelihood that the risk will be effectively managed, and also reduces the exposure of the project. Sharing risk with other parties inevitably leads to a corresponding transfer of all or part of the potential benefit resulting from the avoidance or limitation of that risk. In any supply chain relationship, it is essential that a framework is established which clearly assigns responsibilities, and establishes the relationship between risk and benefit.

A framework which encompasses both risk and benefit can deliver significant project savings by releasing a share of contingencies or gains resulting from risk avoidance, together with other unplanned benefits resulting from favourable performance or events. The framework must recognise that some risks and benefits may not be identified at the outset and should therefore include a mechanism to encourage or reward innovation, exceptional performance or avoidance of risk, even if these risks or benefits were unforeseen. Some aspects of sharing risk and benefit can be incorporated in alliance or partnering arrangements. A good risk and benefit framework will recognise the potential contribution of the wide spectrum of specialist product or service suppliers not normally included in the scope of a partnering agreement, or not known when such agreements are established.

The Essential Activities for operating Risk and Benefit Framework Agreements for projects are:

- Establish the Risk and Benefit Framework Agreement Principles.
- Define the Aims of the Risk and Benefit Framework Agreement.
- Implement the Risk and Benefit Framework Agreement.

The Essential Activities are described in the following Guidelines for Implementation.

Guidelines for Implementation

Traditional contractual relationships attempt to predefine and allocate responsibilities and limit liabilities and risks by incorporating these within a set of contracts. Each party in the supply chain undertakes to fulfill their particular contractual obligations for an agreed price, accepting their own risks but not usually accepting project risks these. In such contracts, while suppliers are often penalised for poor performance, they are less frequently rewarded for enhanced performance. Because suppliers need to assess their own costs and risks at the outset these may be 'locked in' to the project cost by way of individual contingencies or inflated estimates to guard against potential problems. Improved efficiency, a reduction in own costs or the absence of the potential risks may result in a cost reduction to the supplier. However, where such benefits do arise there is rarely a requirement or incentive to release these and hence there is no consequential benefit to the project as a whole. Conversely where risks are underestimated or additional costs or inefficiencies occur then much energy is expended via claims and contract manipulation in attempts to redirect such costs. This is particularly prevalent as the scope of the project develops, as is often the case with complex construction projects. This process can result in a proliferation of non-value adding activities, for example, disputes, progressing, inspections etc.

Traditional practices sub-optimise the performance of individual parts of the supply chain rather than optimising the process as a whole. Innovation is constrained by inflexible specifications and the absence of any mechanism to relate innovation to the benefits flowing from it, particularly when the benefits are indirectly related to the source of the innovation.

Overall this traditional relationship may limit risk but it also limits opportunity and benefits.

5.2.1 Guidelines for Establishing Risk and Benefit Framework Agreement Principles

The main principle of risk and benefit framework agreements is to encourage participants within the supply chain to share some of the risk and potential benefits inherent in a project. Spreading risk in this way reduces the base project cost, making the project easier to justify and more likely to proceed. In exchange for sharing this risk participants are given the opportunity to achieve even greater benefit by sharing in the rewards resulting from a successful project. A successful framework agreement encourages and rewards effective innovation, skill and excellence in a way that releases benefits that would not otherwise have been realised.

Framework agreements attempt to release the considerable potential of the supply chain acting in unison as a team working towards common objectives and sharing in the benefits of a 'job well done'. The agreement should work within, rather than instead of, a normal contractual framework.

Key principles for framework agreements, which should operate in the spirit of the ACTIVE Principles, include:

- The framework agreement should be a formal agreement between parties tailored to suit the particular project circumstances

- Framework agreements should relate to risks and benefits proportional to the involvement or influence of the contractor or supplier concerned. They should be significant enough to achieve a change in behaviour but not so significant that they risk the viability of a participant or deter suppliers from participating

- Participants should not be required/forced or coerced to accept risks against their will nor risks disproportionate to their ability to influence the outcome of the project

- Participants should not be required to accept risks beyond normal commercial practice without the opportunity to gain a proportionately greater benefit

- The details of the framework agreement and the key success criteria should be clearly communicated to all project participants at the outset
- Functional specifications should be used where possible to permit and encourage innovation by ensuring that a supplier fulfils the function required without unnecessarily restricting the manner in which this function is achieved
- Targets should be quantifiable and achievable but should demand a high performance
- Benefits passed on to suppliers should be 'self financing'. Aggregate benefits should never exceed the benefit to the project
- The innovation and commitment of people at all levels is the essence of success. Regardless of the form of the framework agreement, a mechanism should be included to recognise and reward individuals or teams that have brought particular benefit to the project as a whole. This could be financial (e.g. incentives or prizes) or non-financial (e.g. social events or awards)
- It is important that any gainshare should, where practical, be equitably passed down the supply chain
- Opportunity to participate in future projects is a legitimate benefit providing this is openly disclosed and can be quantified and delivered

5.2.2 Guidelines for Defining the Aims of the Risk and Benefit Framework Agreements

- Align the objectives of participating parties with those of the overall project
- Encourage co-operation and the pooling of expertise and resources between participants towards a common goal
- Clearly define the mechanism for allocating and apportioning risks and benefits so that all participants clearly understand their involvement
- Apportion rewards in proportion to each participant's ability to influence the effectiveness of the project and/or the amount of risk assumed

- Encourage innovation, co-operation and effectiveness to help participants achieve a successful project and maximise the added value of their contribution

- Discourage non value-adding activities, additional costs, or activities which may limit the success of the project

- Release 'locked in' contingencies for the potential benefit of a project

- Recognise and reward the source of innovation where such innovation results in benefits to the project

- Monitor and publish the effectiveness of the scheme to enable future projects to benefit from lessons learned from successful implementation

5.2.3 Guidelines for Implementing Risk and Benefit Framework Agreements

Since the circumstances of projects and the relationships between participants are very varied, most risk and benefit framework agreements need to be tailored to meet the specific needs of the project and the participants. Indeed a tailored solution will be more likely to gain commitment from those participating in its design. Care should be taken, however, to allow for the subsequent inclusion of suppliers whose participation in the project could be extremely beneficial but who may not be selected or identified at the time the agreement is designed.

The basic steps in establishing an ACTIVE Risk and Benefit agreement are described below.

Pre-requisite for a risk and benefit framework agreement

The ACTIVE Principles and VEPs must be accepted. This may be done by a formal declaration, encapsulated in contracts, or implied by behaviour. It is unlikely that the full potential of a framework agreement will be realised without participants adopting the ACTIVE Principles and VEPs.

Stages of developing a risk and benefit framework agreement

- Define quantifiable key success criteria for the project

  Because these form the basis upon which risk and benefit is assessed they should be quantifiable, clear, concise and unambiguous. Definition of the key success criteria and their relative weightings is perhaps the most critical stage of developing the framework agreement. Key success criteria directly effect the behaviour of all participants and translate directly into the priorities and resources that they assign towards the respective criteria. Key success criteria are different for each project. Examples of key success criteria are included in Attachment 5.2-A.

- Establish a target for each key success criteria

  This should represent the minimum level of achievement for each success criteria that would enable the project to be described as 'commercially viable'. Achievement beyond this target can be considered a benefit available for sharing on an agreed basis with participants in the framework agreement. The risk is that this target is not achieved which would result in costs having to be shared by the participants.

- Establish the benefit/cost relationship for each key success criteria

  At this stage the project owner should determine the proportion of the potential benefit and risk which is to be shared by the participants in the framework agreement, the remainder being borne by the project. A decision is required at this stage about the level and basis for capping risks and benefits.

- Design the framework agreement

  This should clearly explain how the framework agreement is to be implemented and should allow participants to assess the full implications of being involved. Schemes will vary. For example, they may involve agreement of targets for one or more of the key success criteria, with risks and benefits defined in proportion to achievement and/or the participants commitment. Also, risks may be capped at a level equivalent to a participant’s profit and/or overhead recovery. Benefits need not be capped but if they are this should be at a level which provides adequate incentive to the participants. An alternative 'share' based approach is discussed in Attachment 5.2-B.

  The legality and tax implications of the agreement need to be thoroughly checked and responsibilities for managing and auditing the process should be defined. Care should be taken not to imply that arrangements represent a partnership in a legal sense.

- Involvement and promotion

  A risk and benefit framework agreement will deliver greatest benefit if it is capable of involving all those who have the potential to influence the outcome of the project. The scheme should be flexible enough to recognise the degree to which a participant can influence the project and vary the involvement proportionately.

Promotion throughout the supply chain of the aims of the project and the key success criteria is essential to ensure that the message is clearly understood and implemented, and to engender a feeling that everyone is part of an extended team participating in and benefiting from the outcome of the project.

- Monitoring and payment

  Performance against the key success criteria should be monitored and published to participants including recognition of exceptional performance. Achievement of milestones should trigger payments, the issue of which will reinforce the credibility of the scheme.

- Post project review

  The effectiveness of the agreement should be reviewed periodically to ensure that benefits are forthcoming. On completion, the agreement should be thoroughly reviewed so that future projects and agreements can benefit from the experience gained. A typical checklist containing criteria against which this may be judged is included in Attachment 5.2-C.

Workbook Cross References

VEP 1.7	Procurement Strategy
VEP 3.1.2	Guidelines for Partnering and Alliances
VEP 3.1.4	Guidelines for Risk Management
VEP 3.2	Supplier Selection
VEP 3.3	Contract Dispute Resolution
VEP 5.1	Project Risk Management

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 5.2 originated with the Procurement Workgroup. Refer to Section 5 for contact details.

Attachments

5.2-A Examples of Key Success Criteria.

5.2-B Sample Framework Agreement.

5.2-C Post Project Checklist.

ACTIVE VALUE ENHANCING PRACTICE

No. 5.2 RISK AND BENEFIT FRAMEWORK AGREEMENTS

ATTACHMENT 5.2-A

EXAMPLES OF KEY SUCCESS CRITERIA

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ATTACHMENT 5.2-A

EXAMPLES OF KEY SUCCESS CRITERIA

- **Initial Cost:** Capital cost or purchase cost
- **Running Costs:** Operating cost or whole-life cost/life cycle cost/cost of ownership. This could involve maintenance which could form part of a Framework Agreement formula.
- **Unit Production Costs:** e.g. Resulting process plant
- **Time to Market:** Where early production results in increased revenue or market leadership
- **Profit:** Overall business return on the investment
- **Predictability:** Achieving budget, no 'surprises' etc.
- **Cash:** Timing, spread or limited use of cash or credit facilities
- **Competitiveness:** Performance versus benchmark/competitive performance. A risk element may be the unpredictability of competitive pressures.
- **Investment:** Where benefit arises from future similar investments building on this initial project.
- **Environmental:** Meeting acceptability standard
- **Safety:** Minimum Lost Time Accidents, classified injuries, reduced insurance premiums etc.
- **Approvals:** Timely approvals by regulator/statutory authorities/inspection bodies etc. (e.g. fire regulations)

It is recommended that in the interest of practicality and clarity, no more than five key success criteria are selected. Three or less is optimum to obtain a clear focus on project goals.

ACTIVE VALUE ENHANCING PRACTICE

No. 5.2 RISK AND BENEFIT FRAMEWORK AGREEMENTS

ATTACHMENT 5.2-B

SAMPLE FRAMEWORK AGREEMENT

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ATTACHMENT 5.2-B

SAMPLE FRAMEWORK AGREEMENT

The following example sets out a possible Risk and Benefit Framework. It is not intended to be comprehensive nor a blueprint for use but serves to highlight some of the factors that may be considered. This particular approach allows wider participation than other contract alternatives more suited to alliances or partnerships.

This particular example demonstrates the use of a Risk and Benefit Fund. Participants take 'shares' in this fund. Benefits (if they materialise) are distributed in proportion to the shares held. This approach can be adapted to multiple funds each relating to a different key success criterion, although this increases complexity.

Establish the target for each key success criterion

The minimum level of achievement for ‘commercial viability’.

Establish the benefit/cost relationship for each key success criterion

Quantify the benefits resulting from exceeding the target and the proportion and rate each benefit is to be allocated to the fund(s); and at which level contribution to the fund(s) is to be capped.

Quantify the cost of missing the target and define the proportion and rate at which these costs are to be taken from the fund(s).

Determine an appropriate total level of cost (or risk) to be spread around participants. This will become the expected share take-up and has the effect of reducing the base project cost for the project as a whole because benefits will only be distributed once this cost is covered.

Care should be taken to ensure that the potential benefit from the fund(s) should significantly exceed the level of risk to make the scheme attractive to participants. (A ratio of 2 to 1 (benefit to risk) is recommended as a minimum.)

Where targets are a simple pass/fail (e.g. obtaining an operating license) then an amount may be allocated to fund(s) corresponding to the cost (or progressive cost) of not achieving the target but without any corresponding benefit. Rewards will then relate to other key success criteria.

Define at which stage benefits will be assessed, and milestones when payments under the agreement will be made. (Note: Whole-life cost benefits could be staged).

Where there is more than one key success criterion, an attempt should be made to clearly prioritise these. This may be done by allocating each a relative weighting % (totalling 100%). This weighting may correspond to the relative amounts allocated to the fund(s). This priority will help to focus sub-suppliers where the relationship between their involvement/priority and the subsequent effect on the total project may be more remote.

Establish a mechanism for allocating the fund(s) between alliance partners or major suppliers/contractors.

Each project should determine which companies are considered to be potential ‘alliance partners’, whether or not they are part of a formal alliance agreement. The significance in terms of the Framework Agreement is that they are considered to share the same objectives and have a significant impact on the success of the total project, rather than on one particular aspect of it.

Alliance partners participate by agreeing to 'purchase' shares in the fund(s) as a proportion of their initial tender prices probably up to a maximum of their profit/overhead. 'Purchase' is transacted as a reduction in tender price. The project owner may agree that a similar proportional commitment applies to any variations due to change of scope etc. This process may be established at the tender stage before any formal contracts are let.

Where there are multiple funds and a particular alliance partner has a dominant or disproportionate effect on one or other of the key success criteria then it may be appropriate for that partner to ‘purchase’ shares relating specifically to the key success criteria.

As the project progresses the risks and benefits become more predictable and for this reason it is appropriate to set a stage within the project beyond which more shares cannot be purchased.

If during the course of the project, participants identify an opportunity to offer a cost reduction or innovative solution beyond that which is contractually required, this may be converted into additional innovation shares giving an incentive to declare these savings to the project with the potential for obtaining even greater returns.

Involve sub-suppliers in the framework agreement.

Beyond alliance partners the relationship between cause/effect and risk/benefit becomes more tenuous. Difficulties also potentially arise because of the delay between a sub-supplier fulfilling a commitment and the outcome of the risk and benefit process becoming known. The ability to influence the success of the project as a whole or a particular aspect of it nonetheless exists, and a mechanism that aligns sub-suppliers to the goals of the project has equal potential for success.

In this respect it is proposed that each sub-supplier be given the same details of the Risk and Benefit Framework Agreement as received by the alliance partners so that there is no confusion as to the key success criteria and their weighting. Where a sub-supplier wishes to purchase shares as part of his bid he may do so (but only up to the same proportion as the contractor to whom he bids). His bid will be considered net of this amount. Successful bidders will effectively purchase these shares from the intermediate company. The alliance partner shall at his option be eligible to purchase an additional (replacement) amount of shares equal to those ‘sold’ to the sub-supplier.

Should a sub-supplier feel that the Framework Agreement is inappropriate to his circumstances this should not prevent him from participating in the project, but it should be made clear that his tender may be judged against competitors that may have elected to do so, and whose bids will be considered net of the shares which they are willing to commit to buy.

Defined scope of supply

The scope of supply must be clear between each party, including the initial scope of supply and base price; and a schedule for additions to scope of supply and how (or whether) these participate in the Framework Agreement.

Unplanned additions to contract

Where cost is one of the key success criteria, unplanned additions to contract may be treated as cost overruns and taken from the fund. It may be appropriate where cost is critical, to discourage unsolicited additions to contract by taking these, all or in part, from the shares held by the party initiating the change. If this is to be done then this should be declared clearly at the outset.

Distribution of the risk and benefit fund

The risk and benefit fund will initially contain the value of shares. Should any of the key success criteria not be met then an amount equivalent to the pre-defined cost will be taken from the risk and benefit fund. Should any of the key success criteria be met or exceeded then an amount equivalent to the pre-defined benefit shall be added to the risk and benefit fund.

When the fund becomes positive then the value of the benefits (less the proportion retained for the project) shall be distributed in proportion to the shares issued.

Some allowance may be made to compensate for interest/financing charges for long term projects where benefits only follow long after a supplier's commitment.

Failure to fulfill a contract or bankruptcy shall have the effect of cancelling risk and benefit shares.

Should a client unilaterally shelve a contract then the shares at their notional face value shall be deemed repayable without prejudicing any other recourse to compensation available under the contracts.

Innovation shares may be issued 'free of charge' subject to a specific improvement being achieved. If achieved, these shares are treated as others and are eligible for rewards.

Summary

At all times the Framework Agreement scheme should address the main issues of aligning objectives and promoting a shared, team approach to exceeding the goals of the project. If the correct key success criteria are selected and the correct weighting assigned, the benefits obtained by focusing upon these will outweigh lesser achievement on less critical activities.

ACTIVE VALUE ENHANCING PRACTICE

No. 5.2 RISK AND BENEFIT FRAMEWORK AGREEMENTS

ATTACHMENT 5.2-C

POST PROJECT CHECKLIST

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ATTACHMENT 5.2-C

POST PROJECT CHECKLIST

This list is designed to assist with checking how the implementation of the Risk and Benefit Framework Agreement compares with the original objectives.

1. List ways in which different practices were adopted because of the Framework Agreement
2. What were the key success criteria? Were they achieved Yes/No? or Exceeded Yes/No?
3. Did everyone receive a copy of the Framework Agreement?
4. Did everyone understand the scheme?
5. What proportion of participants would recommend adoption of the scheme for future projects?
6. What measurable benefit accrued to the project/client for each key success criterion?
7. What quantified cost was incurred by failing to meet key success criteria?
8. What measurable benefit accrued to each participant?
9. How many parties participated?
10. Were the key success criteria and weightings correct for the project?
11. What was the relationship between the risk value and the benefit value?
12. Would you adopt a similar scheme in the future?
13. What improvements should be made?
14. How many additions to contract were negotiated?
15. How many innovations were identified?
16. Was there an overall saving? If so what percentage of project cost does this represent?

ACTIVE PRINCIPLE 6

EFFECTIVE INNOVATION AND CONTINUOUS IMPROVEMENT

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ACTIVE PRINCIPLE 6

EFFECTIVE INNOVATION AND CONTINUOUS IMPROVEMENT

In order to survive in a competitive environment, it is essential that companies innovate. Innovation should not be confined to product technology but should be apparent throughout the business process including the capital project process. While this is desirable it is not easy to achieve since many current practices in the industry discourage innovation. However, for the industry to move forward to greater competitiveness, traditional practices must be challenged and, if found lacking, replaced by more effective solutions.

From the start of a project, teams should consider innovative alternatives to achieve the business and project objectives which challenge existing assumptions. Significant benefit can be achieved by channelling innovation towards improving operational systems, technology and plant performance. The application of innovative solutions to both project engineering and project management can significantly enhance the performance of a capital investment.

This culture of innovation and continuous improvement should also extend throughout the supply chain. Innovation should be encouraged at all stages of the project process from feasibility to completion. New ideas which facilitate the achievement of project objectives should be properly rewarded while confidentiality and intellectual property rights are upheld. This entails changing many traditional contractual arrangements which often discourage or do not properly reward innovation.

The benefits of technical innovation are greater at the conceptual stage of a project before implementation commences. Much can be gained by developing cost effective options during the project definition phase, particularly through the involvement of contractors or suppliers with special expertise, or when a novel design is being proposed. Use of novel or complex technology, such as complex control systems, can sometimes be difficult to manage with increased uncertainty of project outcomes. It is important, therefore, that the application of new technology is properly assessed beforehand in terms of risk, and that development programmes are not allowed to create disruptive changes during project execution.

Innovation and continuous improvement also have a significant part to play during the project execution phase where imaginative solutions can often yield benefits in terms of time, cost or technical effectiveness. Aspects of project implementation such as contracts, site working practices, safety, design methods, project organisation, troubleshooting and communications are areas where there is often scope for innovative ideas to improve methods of achieving the project goals.

All phases of the project life cycle will benefit from exploiting the integrated experience and capability of the project team, while ensuring that efforts are focused on improving, in practical achievable increments, the methods and procedures adopted.

Lessons learned as the execution of the project proceeds should be captured through a process which encourages those involved to feed experiences forward for the benefit of future projects. This process should be ongoing beyond the end of the project to ensure operational experience is also captured. Lessons learned at the early developmental stages of projects are often of most value since it is at this stage that the biggest opportunity for value enhancement exists. It is often beneficial to hold periodic 'peer reviews' with other projects, including projects from other companies, to share learning and experience.

Key activities in developing continuous improvement on projects are:

- Defining and targeting specific areas where improvement can be achieved
- Setting specific improvement objectives and, where possible, benchmarking the outcome
- Establishing a 'challenge' culture on projects where the project team can challenge and test assumptions within the constraints of the project objectives
- Establishing an effective process for capturing learning and ensuring it is applied on future projects
- Reviewing options and selecting methods by which improvements can be achieved, establishing the most practical means to implement these
- Continually monitoring performance against agreed objectives and targets
- Reviewing progress and ensuring that all positive feedback is channelled towards further performance improvement
- Holding periodic 'peer reviews' with other projects to share learning
- Reviewing operational experience on the plant one year after start up

Supporting Value Enhancing Practices:

VEP 6.1	Continuous Improvement
VEP 6.2	Innovation and Intellectual Property

ACTIVE VALUE ENHANCING PRACTICE

No. 6.1 CONTINUOUS IMPROVEMENT

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ACTIVE VALUE ENHANCING PRACTICE

No. 6.1 CONTINUOUS IMPROVEMENT

Purpose and Benefit

Continuous improvement is the process by which the levels and range of services available within a project or organisation are increased, and by which the standards of performance of those services are raised. Application of ACTIVE VEP 6.1 will assist with the process of continuous improvement, offering the potential to deliver commercial benefits and bring enhanced satisfaction to individuals through the achievement of new targets.

All phases of the project life cycle will benefit from exploiting the integrated experience and capability of the project team, while ensuring that efforts are focused on improving, in practical achievable increments, the methods and procedures adopted. Innovation must be encouraged and channelled toward improving operational systems, technology and the performance of the facility.

Essential Activities

Continuous improvement must be recognised as a process in its own right. There must be a formal commitment to continuous improvement, and enthusiastic support for this process from top management which must be effectively communicated and understood by all personnel. All participants in the improvement process must be committed to achieving success.

The Essential Activities are:

- Define the areas where continuous improvement will be applied.
- Set the improvement objectives and, where appropriate, benchmark targets.
- Review and select the methods by which improvements can be achieved and establish the most practical means to implement these.
- Monitor performance against agreed objectives and targets.
- Review progress and ensure all positive feedback is channelled toward further performance improvement.

Guidelines for Implementation

6.1.1 Guidelines for Defining Areas of Application

A corporate and project strategy for the implementation of continuous improvement should be included as a key feature in the project execution plan, which encourages a culture of total quality management.

From the project organisation carefully select integrated work groups to review:

- Current project improvement requirements
- Historical results which highlight the need for improved future performance
- Traditionally 'acceptable' areas of poor performance
- Client or customer comments and requirements
- Process operational comments and requirements
- Feedback on previously monitored performance
- Potential for applying 'business process re-engineering'

All ideas for improving performance arising from the integrated work groups should be recorded and communicated. Ensure that the areas selected for continuous improvement will enhance services in terms of safety, quality, schedule, cost and added value.

6.1.2 Guidelines for Setting Improvement Objectives

For the areas selected for improvement, establish the appropriate industry best practices and potential degree of improvement which could be achieved. Comparison with industry or company benchmarks will assist in this process. Targets must be challenging but remain realistic.

Client or customer requirements should be taken into account. If possible the client and key contractors should work in an alliance or partnership to achieve mutual project and business goals which are directly or indirectly linked to the selected areas for continuous improvement.

A training programme should be established as part of the preparations to encourage team working and effective communications, and assist with the setting of stretched targets. Consideration should be given to operating an incentive scheme for promoting and achieving continuous improvements with an appropriate reward system.

6.1.3 Guidelines for Reviewing and Selecting Methods

A wide range of methods is available for the analysis of performance and the subsequent targeting of practical improvements. The most widely used methods are listed in Attachment 6.1-A.

While methods and tools will assist the process of continuous improvement, it is important that fundamental project activities and procedures are not overlooked when addressing the practical means of improving performance. Many of these, for example planning and cost control, communications and information technology, value engineering and safety, health and environment (SHE), are addressed in other ACTIVE VEPs.

6.1.4 Guidelines for Monitoring Performance

The regular and consistent monitoring of improvement objectives and benchmark targets is an essential activity in ensuring that rewards flow from the introduction of a process of continuous improvement. Attachment 6.1-A lists a range of tools which can be tailored to monitor performance, but fundamental activities, for example critical path progress, milestone achievement, productivity measurement and cost recording, must continue to be used.

Individuals should be encouraged to embark on the process of professional development. Regular appraisal reviews, typically every six months, should be carried out for individuals in which performance targets, related to the continuous improvement process, are set and monitored.

6.1.5 Guidelines for Reviewing Progress

Feedback mechanisms should be established to support improvement by adopting lessons learned from past projects, as well as those experienced during the current project. Both success and failure lessons must be included in the feedback chain.

At this stage, 'brainstorming' sessions which examine alternative approaches can prove very useful for finding cost effective alternative solutions, or reversing adverse trends. A formal project close-out analysis which includes a lessons learned section will ensure the effective transfer of experience for all new projects. This should include :

- Objective analysis by all parties of what went well and what didn't go well, and why
- Willingness to share experience with those outside the project team
- Ensuring the outcome is shared with all those who can learn from the experience

Workbook Cross References

VEP 1.4.3	Guidelines for Seeking Continuous Improvement
VEP 2.1.10	Guidelines for Challenge and Change
VEP 7.2.4	Guidelines for Review
VEP 7.3.2	Guidelines for Constructability Reviews
VEP 8.1	Performance Benchmarking

Further Reading

ECI TF017. Grow Your Own Improvement Team. ISBN 0727725068.

ECI TF017. Implementing Total Quality in the Construction Industry.

For ECI contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 6.1 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

6.1-A Methods for Assisting Continuous Improvement

ACTIVE VALUE ENHANCING PRACTICE

No. 6.1 CONTINUOUS IMPROVEMENT

ATTACHMENT 6.1-A

METHODS FOR ASSISTING CONTINUOUS IMPROVEMENT

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ATTACHMENT 6.1-A

METHODS FOR ASSISTING CONTINUOUS IMPROVEMENT

A number of the most widely used tools which can be applied to the process of continuous improvement are briefly described below.

Data Collection Interviews and Questionnaires

Interviews and Questionnaires are techniques for collecting views and perceptions of project performance, from inside or outside a projector organisation. They can also indicate how a performance might be improved in the future. The answers are used as data which can then be used to help decide on a future course of action.

Brainstorming

Brainstorming is an intentionally uninhibited technique for generating the greatest number of ideas and possible causes of problems or solutions, for later evaluation and investigation. It is the rapid pooling of ideas which a group of people generate before any discussion or evaluation takes place.

Cause and Effect Analysis

Cause and effect analysis is a technique for identifying the possible causes affecting a problem or project. A cause and effect diagram is a simple yet powerful method of graphically recording possible causes and relating these to their effects.

Performance Check Lists

Performance check lists provide a systematic method of recording project performance in a simple way. They are used to understand and quantify problems which need to be investigated.

Concentration Diagrams

Concentration diagrams are visual displays of the location and frequency of defects or problems within current or past projects. They are used to show where a defect or a problem consistently occurs on a product or in a process.

Process Flowcharts

A process is a system which converts an input into an output by performing work or tasks. Analysis of a process is a complex subject, since a process can be analysed against a number of criteria. Process flowcharting helps analyse processes in sequential steps to improve understanding of performance.

Activity Sampling

Activity sampling is a means of making random observations of a project process or activity to gain an understanding of the overall performance or status of that process. It enables conclusions to be obtained from a limited number of discrete observations at a reduced cost.

Data Handling

Various techniques are available to display project specific data in pictorial form for analysis. They include tally sheets, frequency distributions, histograms, graphs and charts.

Pareto Analysis

Pareto analysis is a simple technique that helps separate the major causes (the vital few) of project problems, from the minor ones (the trivial many). It is also known as the 80/20 rule, i.e. 80% of the problems are due to 20% of the causes.

Force Field

Force field analysis is a technique for formally listing and analysing the various forces acting in a given situation, or affecting a given problem. The analysis enables the selection of a course of action, recognising both the positive forces (those acting or potentially working for improvement) and negative forces (those potentially working against improvement).

Ranking and Rating

Ranking is the structured process of placing a number of options in order of preference. To rank options it is necessary to score them. This scoring is called rating. In rating each of the options, scores are based upon preselected criteria.

Solution Effect Diagrams

Solution effect diagrams are used to test potential solutions and to identify all the effects of these solutions. Similar to cause and effect diagrams, they are powerful visual tools; in effect they are cause and effect diagrams in reverse.

Failure Prevention Analysis

Failure prevention analysis (FPA) is a systematic approach for examining project activities (a system, procedure, operation or process) to determine potential failures. Having identified possible failures, actions which remove or reduce the probability of their occurrence can be devised and implemented.

ACTIVE VALUE ENHANCING PRACTICE

No. 6.2 INNOVATION AND INTELLECTUAL PROPERTY

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ACTIVE VALUE ENHANCING PRACTICE

No. 6.2 INNOVATION AND INTELLECTUAL PROPERTY

Purpose and Benefit

The long term survival of the process and energy industries depends upon continuing innovation and improvement in performance. This applies to the capital project process, both in introducing and applying new technology, and in introducing new methods and business processes to the delivery of engineering construction projects. This ACTIVE VEP gives guidance on how improvements can be achieved by harnessing the skills and talents of the supply chain, while at the same time protecting intellectual property rights and fair reward for innovation.

Essential Activities

Essential activities for developing innovation and protecting intellectual property on projects include:

- **D**efine and target specific areas where improvement is required and set specific improvement objectives.
- Harness the knowledge and skills of the entire supply chain to gain improvement through fair reward and respect for intellectual property rights.
- Establish a 'challenge' culture on projects where the project team can challenge and test assumptions within the constraints of the project objectives.
- Establish a process for evaluating options and selecting methods by which improvements can be achieved.
- Establish a process for capturing learning on the project and ensure it is applied on future projects, channelling feedback toward further performance improvement.

The Essential Activities are discussed in more detail in the following Guidelines for Implementation.

Guidelines for Implementation

'Innovate or die' is an adage that applies as much to the process and energy sectors of industry as anywhere else. Survival in a competitive environment demands that companies innovate. This culture of innovation applies to all aspects of the business and should not be confined purely to technology or science driven innovations but should include innovative approaches to all business processes including the capital project process. While this may be desirable it is not easy to achieve since many current practices in the industry discourage innovation. However, for the industry to move forward to greater competitiveness, traditional practices must be challenged and, if found lacking, replaced by more effective solutions.

6.2.1 Guidelines for Defining Improvement Objectives

At the outset of a project, the team should review the project and business objectives to identify potential areas which are in need of improvement and which would benefit from an innovative approach. Where appropriate, contractors and suppliers should be brought into this process where they have specific experience, knowledge or ideas to contribute which might improve project performance.

Areas to consider for potential improvement might include:

- Process technology
- Technical solutions to known problems
- Equipment performance
- Control systems
- Design methods
- Project process and management
- Nature of contracts and commercial relationships
- Procurement processes
- Team building, motivation and management
- Handover, start up and operational methods
- Construction techniques such as pre-assembly/off-site construction
- Use of information systems

While the potential benefits are greatest during concept and definition, innovation should be encouraged at all stages of the project process from feasibility to completion. Innovation and continuous improvement have a significant part to play during the project execution phase where imaginative solutions can often yield benefits in terms of time, cost or technical effectiveness. Aspects of project implementation such as contracts, site working practices, safety, design methods, project organisation, trouble shooting and communications, are areas where there is often scope for innovative ideas to improve methods of achieving the project's goals.

6.2.2 Guidelines for Harnessing Innovation in the Supply Chain

Since most suppliers and contractors work across a number of operating companies, the supply chain provides a rich, and often untapped, source of experience and knowledge which can be harnessed in improving project performance. Whether this experience is available through improved products and equipment or in the methods and processes of project delivery, early involvement of the supply chain at the conceptual and definition stages of projects can often bring considerable benefit.

Unfortunately, many traditional working practices within the industry make it difficult to involve the supply chain early in the project process. Operating companies have been reluctant to involve suppliers and contractors at this early stage, fearing loss of confidentiality and prejudicing subsequent fixed price tendering. Suppliers, on the other hand, are wary of putting forward innovative ideas through fear of lack of protection of intellectual property and the concern that ideas generated at the pre-contract stage will not be rewarded.

Much, however, can be done by adopting a different approach to supply chain relationships and many traditional contractual practices can and must be challenged. Alliance and partnering arrangements make it much easier to encourage the sharing of ideas between parties without loss of commercial protection. Much more has yet to be done to define commercial arrangements which positively encourage an early contribution from the supply chain. The increasing use of integrated project teams does much to foster the introduction of new ideas to facilitate the achievement of project objectives. Within such teams, new ideas need to be encouraged and properly rewarded while confidentiality and intellectual property rights are upheld.

To encourage innovation, consideration should be given to different contractual arrangements, for example:

- At an early stage in the project, select a contractor or supplier on the basis of a paid study which culminates in a priced tender. The vendor with the most innovative and cost effective proposal should be rewarded with the contract.

- Encourage innovation by linking payment of a fixed sum for bid costs against savings produced by the vendor. The most attractive offer should win the contract but the other vendors could be paid a proportion of the fixed bid sum in relation to their cost difference from the successful vendor.

At all phases of the supply chain cycle it is important that vendors are given positive incentives to be creative and innovative in their proposals since there are often risks in innovation which can lead to caution or conservatism on the part of the vendor.

For the buyer to benefit from an innovative approach there are issues of intellectual property ownership and value which need to be protected if novel solutions and ideas are to be shared in the supply chain. Confidentiality agreements are needed on both sides but this can be difficult at the pre-contract stage where sometimes the novel approach of one bidder is shared, to his disadvantage, with other competitors in the bid process. This practice, besides being unethical, stifles innovation and leads to uncompetitiveness. A way of dealing with this is for the parties to define some form of agreement which will protect the bidders position.

For example, vendors might be rewarded for innovation by retaining ownership of intellectual property in exchange for the buyer's free and unrestricted use of the innovation.

6.2.3 Guidelines for Establishing a Challenge Culture

The establishment of a project culture by which individuals are positively encouraged to challenge existing ways of doing things in order to better achieve project objectives, is important and will be greatly helped by the building of an integrated team for project delivery. An integrated team will ensure the cross-fertilisation of ideas and avoid the dangers of people working in narrow functional boxes. Geography can help and an open plan, multifunctional project office where ideas and options can be developed will greatly facilitate the free flow of ideas.

Contractors and suppliers often find it difficult to challenge clients' ideas and assumptions in the mistaken belief that the customer is always right. There is a need, however, for the supply chain to align more closely with the customer's real objectives by a process of testing and challenging the scope and basis of what is proposed. This must be done, however, in a climate of co-operation and teamwork rather than adversarial positioning. In this way trust and confidence will be built up, encouraging a shared approach to risk and reward and releasing an untapped potential for improvement.

It is important that the process of challenging is focused on the achievement of common project objectives. Innovation and questioning for its own sake can frustrate project progress and become very disruptive. It is essential that new ideas should be developed within the context of the project process and should not jeopardise achievement of the project programme.

6.2.4 Guidelines for Evaluating and Selecting Improvement Options

To harness the combined skills and knowledge of the project team effectively, it important that a process is in place for the evaluation of options and ideas as they arise. Options will fall into different categories and the process needs to recognise that there will be many suggestions and novel approaches which, however interesting or exciting, cannot be adopted by the project. There might be several reasons why this is so:

- The idea needs further development and time and resources are not available within the project
- The proposed solution may have downside risks which the project is not prepared to take
- The costs are too high for the project
- The improvement might have implications beyond the project and require a wider forum of debate or acceptance

The process, however, should ensure that the ideas are captured and recorded since it may be possible to develop them for future projects or other areas of application.

Where ideas are accepted for the project, it is important that they are fully reviewed before implementation since such approaches can sometimes be difficult to manage with increased uncertainty of project outcomes. It is important, therefore, that the introduction of new or novel ideas are properly assessed beforehand in terms of risk and that development programmes are not allowed to create disruptive changes during project execution.

6.2.5 Guidelines for Capturing and Applying Learning

The process for generating, evaluating and implementing new ideas should also extend to regularly reviewing the performance of improvements after implementation in terms of helping achieve project objectives. The process should also review lessons learned as the execution of the project proceeds and should capture this learning through a process which encourages those involved to feed experiences forward for the benefit of future projects. This process should be ongoing beyond the end of the project to ensure operational experience is also captured. Lessons learned at the early developmental stages of projects are often of most value since it is at this stage that the biggest opportunity for value enhancement exists. It is often beneficial to hold periodic 'peer' reviews with other projects, including projects from other companies, to share learning and experience.

Workbook Cross References

VEP 1.2	Project Definition and Objectives
VEP 1.4	Value Analysis
VEP 1.7.3	Dealing with Intellectual Property Issues
VEP 2.1.9	Guidelines for Knowledge Management
VEP 3.1.6	Guidelines for Innovation and Intellectual Property
VEP 5.1	Project Risk Management
VEP 7.2.2	Guidelines for Design
VEP 7.4.10	Guidelines for accepting innovative ideas

Further Reading

None.

ACTIVE Workgroup

ACTIVE VEP 6.2 originated with the Procurement Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE PRINCIPLE 7

EFFECTIVE PROJECT EXECUTION

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ACTIVE PRINCIPLE 7

EFFECTIVE PROJECT EXECUTION

The effectiveness of the execution stage of a project will depend greatly upon the quality and thoroughness of the project definition and the extent to which the project objectives, scope, strategy and execution plan have been defined. The way in which a project is subsequently managed through the execution stages can be crucial to delivering an effective project but this depends upon an effective project process being in place.

The key methods for improving project execution include:

- Effective control of schedule, costs and changes to scope, plus the timely provision of competent resources needed to deliver the project

- An efficient detailed design and specification process which ensures the project will meet its objectives and deliver a plant which can be built and operated in a cost effective manner

- Ensuring that supply chain relationships work effectively and that contractors, subcontractors and suppliers operate as part of the team with true alignment to project goals

- Early evaluation of key construction issues, especially interfaces with existing plant operating areas. Most importantly this should include issues of site safety

- Ensuring hand over processes operate seamlessly at the various interfaces, for example from design team to procurement and construction; from construction to start up team; and from start up team to final operators. It is particularly important at handovers to ensure that costly and time consuming duplication of checking, testing and inspection is eliminated

- Efficient site organisation and effective materials management

- A strong, consistent and effective safety, health and environmental policy applied throughout the project

- The implementation of an effective communications strategy within the team as well as across other key project interfaces.
- Maintaining sound processes for monitoring, reporting and reviewing progress

Supporting Value Enhancing Practices:

VEP 7.1	Project Control
VEP 7.2	Design Effectiveness
VEP 7.3	Constructability
VEP 7.4	Standards and Specifications
VEP 7.5	Project Handover and Commissioning

ACTIVE VALUE ENHANCING PRACTICE

No. 7.1 PROJECT CONTROL

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ACTIVE VALUE ENHANCING PRACTICE

No. 7.1 PROJECT CONTROL

Purpose and Benefit

Application of ACTIVE VEP 7.1 will help project teams understand the basis of project control, focusing on the effective forecasting of project requirements and managing the key parameters of cost, time, resources and project scope through all stages of project execution. These parameters provide the basis for actual performance to be measured, which will in turn identify any necessary controlling or corrective action. Good project control depends upon a sound project definition and the quality of project programmes, resource schedules, cost estimates and project scope documents produced at the definition stage.

Essential Activities

- **Supporting systems and tools**

  The project infrastructure must be established to support project control tools.

- **Forecasting**

  The forecasting of key project measures throughout the execution of the project including costs, time schedule and resources

- **Reporting**

  Measurement of actual situation versus planned as a method of reporting status.

- **Controlling**

  The decision processes for the control of project performance using information from the planning process.

Feedback

Using key measures and new information from the planning process to improve the performance of future projects.

Each of the Essential Activities is addressed in more detail in the following Guidelines for Implementation**.** A check list for project control is included in Attachment 7.1-A.

Guidelines for Implementation

7.1.1 Guidelines for Supporting Systems and Tools

The project organisation requires the necessary infrastructure in place to support project control tools including:

- A cost management system for collection, monitoring and displaying project costs and forecasts, including money actually spent, money committed and costs yet to be incurred.
- Planning tools to enable the network planning of all project activities in critical path schedules at various levels, to display manpower plans and work schedules based on a work breakdown structure.
- Systems for the management and control of change
- Measurement tools for other key project parameters which indicate progress toward achievement of project goals
- Reporting systems for the retrieval, aggregation and presentation of key project information

It is imperative that adequate and trained resources are available to the project to use the project control tools.

7.1.2 Guidelines for Forecasting

It is not sufficient for project control systems to provide only the means for monitoring and reporting progress as the project proceeds. They must also include a forecasting capability if the project is to be effectively managed through all stages of execution.

The key areas of forecasting include the following:

- **Critical path and float**

It is essential that continual reviews of the programme are carried out to define a forecast view of the forward activities of the project. Use of critical path networks and knowledge of activity float in the programme enable the programme risks to be assessed. Consideration can be given to contingency planning in the event of delay or impact to the critical path.

- **Resources**

Comprehensive histograms are required for forward planning of manpower resources. Since implementing changes in manpower requirements can have significant lead times, forward planning and forecasting is essential to avoid project delays.

- **Capital expenditure**

Prediction of cost expenditure and anticipated final cost (AFC) for manpower, equipment and materials is a key forecasting requirement throughout the life of the project.

The provision of regular updates of forecast expenditure is required for all elements of the project cost. This should be broken down into the same elements as the agreed budget to allow comparison and control. As a minimum, forecasts should include: the method by which the elements of the forecast have been calculated; reasons for any significant deviations from the figures in the agreed budget; identification of areas of particular risk within the forecast; and an indication of the level of probability of achieving the forecast figure ,with explanation of any contingency provision in forecast.

7.1.3 Guidelines for Reporting

The required level of reporting for project control should be defined as part of the information strategy for the project, and should provide clear and timely presentation of information in a form which will enable project control decisions to be made quickly and effectively. Wherever possible, reports should be tailored to meet the needs of those responsible for making the decisions. Unnecessary or irrelevant information can often obscure the important and relevant data on which decisions need to be made.

For effective project control the following are important:

- **Reporting format**

  The reporting format should be agreed at the outset of the project, with a report routing system to ensure all relevant personnel receive appropriate reports. A procedure must also be established for reporting deviations, trends and other project information at fixed intervals. While tabulated data is important, use of a graphical display is often better at highlighting trends and clarifying where action is needed.

- **Measurement of earned value**

  The concept of earned value as a way of relating progress to cost is now a well established technique. Project control reports should compare earned value versus planned value as a basis for measurement of performance and efficiency. Feedback from the engineering, procurement, construction and commissioning activities must be timely and accurate and should be based on specific measured values (the 'earned value'). Supporting systems may be required for the measurement of complex activities such as construction.

7.1.4 Guidelines for Project Scope Control

The planning process should provide a mechanism for the control of the project scope. The work breakdown structure should have been based on the scope defined during project definition and this should be reflected in the project plan. Hence mechanisms need to be in place to monitor and control deviations from the plan, plus a change control procedure to deal with scope changes which arise after definition.

Measures for controlling the project include:

- **Corrective action**

  A procedure should be established to assess the risk of deviation from the project plan and to determine necessary corrective action. A forward view of project events should be encouraged to enable corrective action to be taken before deviation occurs.

- **Protocol procedure**

  A protocol procedure should be established between engineering, procurement and construction to enable discussion of changes and recommendations prior to implementation.

- **Change control procedure**

  Justification is required for any change to the project's scope. The impact of proposed changes should be evaluated by considering cost savings, schedule, plant performance, operation, maintenance, safety and environmental etc. The most effective projects maintain tight control of scope and limit changes to essential changes only. It is important to have clearly defined criteria of what 'essential' means.

  Authorisation of any change should involve persons nominated to review, estimate and approve. Recording of proposed and agreed changes is important and, for agreed changes, communication of the change to all parties involved or effected is essential.

7.1.5 Guidelines for Feedback

An interactive procedure should be established to record information for future projects by the archiving of all relevant project records. To be effective in feedback, mechanisms must be established to ensure that the lessons learned are clearly drawn from the recorded information and communication channels put in place to disseminate those learning points across the project organisation.

Workbook Cross References

VEP 1.1	Project Process
VEP 1.2	Project Definition and Objectives
VEP 1.3	Project Planning
VEP 7.3	Constructability
VEP 7.5	Project Handover and Commissioning

Further Reading

CII SD6. Control Of Construction Project Scope. Research report.
CII 43-1. Project Change Management. Special Publication.
CII 43-2. Quantitative Effects of Project Changes. Research summary.
For CII contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 7.1 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

7.1-A Check list for Project Control.

ACTIVE VALUE ENHANCING PRACTICE

No. 7.1 PROJECT PROCESS

ATTACHMENT 7.1-A

CHECK LIST FOR PROJECT CONTROL

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ATTACHMENT 7.1-A

CHECK LIST FOR PROJECT CONTROL

		Yes	No
1.	**GENERAL**		
1.1	Have procedures been agreed for:		
	Estimating?	☐	☐
	Scheduling?	☐	☐
	Cost Control?	☐	☐
1.2	Have responsibilities for all elements of the works been defined?	☐	☐
2.	**ESTIMATING**		
2.1	Has the estimate been generated in a manner which permits costs to be traced back to supporting calculations/assumptions?	☐	☐
2.2	Have the calculations been based on standard work rates, quoted prices, etc.?	☐	☐
2.3	Have you carried out a risk analysis?	☐	☐
2.4	Has sufficient contingency been allowed?	☐	☐
3.	**PLANNING**		
3.1	Do your reporting arrangements include trend indicators for:	☐	☐
	Cost?	☐	☐
	Progress?	☐	☐
	Productivity?	☐	☐
	Project staffing?	☐	☐
	Scope changes?	☐	☐

3.2	Have you agreed the frequency of reporting and the recipients of reports?	☐	☐
3.3	Have you agreed review meeting frequencies and participants?	☐	☐
3.4	Do you have a corrective action procedure for deviation?	☐	☐

4. COST CONTROL

4.1	Have you agreed the format, content and frequency of cost report generation?	☐	☐
4.2	Is you report based on committed cost?	☐	☐
4.3	Have the works been categorised to allow meaningful comparison with the estimate?	☐	☐
4.4	Is the basis of calculation the same as used for the original estimate?	☐	☐
4.5	Does the report include trend indicators?	☐	☐
4.6	Does the report highlight areas of deviation?	☐	☐

5. FORECASTING

5.1	Are your reports based on known committed costs and a best estimate of costs to be incurred?	☐	☐
5.2	Do your forecast costs allow for escalation due to inflationary factors?	☐	☐
5.3	Have you compared known committed cost with those in the estimate?	☐	☐
5.4	Have you allowed for any change in scope?	☐	☐
5.5	Is your project manager responsible for and involved in forecasting?	☐	☐
5.6	Is your forecast produced/reviewed to an agreed appropriate timescale?	☐	☐
5.7	Does you report highlight areas of deviation?	☐	☐

ACTIVE VALUE ENHANCING PRACTICE

No.7.2 DESIGN EFFECTIVENESS

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ACTIVE VALUE ENHANCING PRACTICE

No. 7.2 DESIGN EFFECTIVENESS

Purpose and Benefit

Application of ACTIVE VEP 7.2 will ensure that the design meets the required standards for the project at minimum cost.

An effective design will provide an asset which is safe, meets the project objectives, is constructable, operable and cost effective.

A key feature of effective design is the minimisation of redesign work, with the result that designers will be more likely to show a profit on their work, constructors will be clear about the scope of work, and the client will be satisfied with the outcome.

Essential Activities

Pre-Design Activities

Identify the extent of project definition which is firm and agreed.

Conduct an initial design team meeting.

Establish roles and responsibilities for team members.

Design Procedures

Use the team's experience to ensure 'fitness for purpose' is achieved and innovation encouraged.

Employ appropriate technology, both for design activity, and in the selection of processes and equipment for the asset.

Apply value management techniques on a life cycle basis, ensuring lessons learned from previous projects are incorporated into the design.

Design Communications

Develop a communications strategy and establish a document management system.

Convene regular design team workshop meetings.

Design Review

Conduct regular safety, constructability and operability reviews against key milestones, incorporating lessons learned where appropriate.

Establish rigorous criteria for accepting proposed design changes.

Perform regular design audits to ensure compliance.

The Essential Activities are addressed in more detail in the following Guidelines for Implementation. Check lists for engineering disciplines are included as Attachments.

Guidelines for Implementation

As construction projects increase in complexity, design teams are making greater use of specialist suppliers or those with specialist or patented process knowledge. To meet the demands of more complex methods of construction and shorter timescales, the construction process needs to be represented as early as possible to maximise the effectiveness of the design stage.

An effective design will therefore result from an appropriate balance of effort from all contributors. This emphasises the need for sound design management, therefore making the role of design manager critical. In some smaller projects the project manager may be the design manager, the role changing to construction manager and operations manager as the project progresses.

7.2.1 Guidelines for Pre-Design

Project definition and design management

The design manager must ensure that the project definition is agreed and fixed with the project owner. If this is not possible, then the design manager must agree those parts of the project which need further conceptual work, and agree when this is to be completed, particularly if the work is on the critical path. Design personnel from contractors and suppliers should liaise closely with the client team to ensure that definition requirements are successfully transferred into the design.

Establish the roles of design team members

Once the scope of the design work is established, those best equipped to carry out the design must be determined by the project manager. The project manager should at this point consider, in the context of the procurement strategy, how the project or elements of the project are to be procured. If 'design and build' is selected for the whole project, then the design process for the team would be limited to the compilation of functional specifications for tendering.

Initial design team meeting

From the outset, the design manager and the design teams should carry out their work in a spirit of openness and with an 'internal customer' culture. In conjunction with this, the needs of the construction team must be listened to and acted upon. Key items on the agenda for the initial design team meeting should be:

- Share and discuss project objectives
- Introduce project team building for all design team members
- Define team responsibilities
- Establish programme for initial data gathering and design input, and ensure that the programme covers all elements of the work
- Establish key design milestones
- Determine design deliverables and their detail
- Establish modes of communication

7.2.2 Guidelines for Design Procedures

Use the team's experience

- Ensure the team has the right ‘mix’ of competencies to undertake the design. For all but the most detailed level of functional designs, the team should operate in a multifunctional environment
- Establish interfaces with other members of the project team and beyond, especially for design approvals procedure and the authority to change design
- Ensure that a structured design process is in place which will effectively balance the competing requirements for encouraging innovative thinking with the time, risk and cost constraints of the project
- Wherever possible use standard or repeat designs, encouraging the use of ‘black box’ design modules. However, check that such designs meet the functionality requirements of the project
- Establish learning reviews as the design proceeds to develop improvements and avoid poor design practice. Try to maintain continuity of staff from the original design team to ensure design support is available during construction and handover
- Establish and maintain a manual for standard designs and details to avoid repeating design effort in the future

Use appropriate technology

- Select design technology appropriate to the project. An integrated computer aided engineering (CAE) approach is preferable to minimise information transfer interfaces
- Set design safety factors with care to ensure safety factor accumulation does not result in over design and increased cost
- Use the BATNEEC (Best Available Technology Not Entailing Excessive Cost) approach to assess the chosen solution for safety, health and environmental considerations
- Design the asset in accordance with its required availability, reliability and design life
- Technology solutions should be carefully evaluated during design to ensure that the most appropriate technology is selected, consistent with the project requirements for time, cost and risk

Apply value management

- Value analysis and value engineering techniques should be used routinely during the design process to ensure that functional requirements are met at optimal cost to balance capital and operational expenditure

- Assessment criteria for design decision making should be based on whole-life costing as basis agreed with the project owner. Designers should beware of selecting options which may reduce capital costs but will increase operational costs, adversely affecting the economic case

7.2.3 Guidelines for Design Communications

Implement agreed strategy

- A communications strategy should be defined for the design process and agreed with all participants. This should be consistent with, and part of, the overall communications strategy for the project. The strategy should cover communications with those who may have an input into the design or an interest in the outcome, and not be confined solely to communications within the design team
- Wherever appropriate, maximum use should be made of information management systems and CAD/CAE systems to integrate communication of information
- An effective document management system must be established to enable the co-ordination and control of the issue of documents
- Where possible, the design team should be located in a multifunctional, open plan environment to aid informal communications and generate a supportive atmosphere and good team spirit. Where this is impracticable, regular meetings, visits or video conferences will be necessary between the various design offices for designers to share their results with the rest of the team

Design feedback

- Availability of key members of the design team is important throughout the subsequent procurement, construction, hand over and start up stages of the project in order that design issues arising during those stages can be effectively resolved. An efficient feedback process to the design team is essential. For most projects it is greatly beneficial to transfer design staff to the construction site to resolve queries on site during these stages

7.2.4 Guidelines for Design Review

Establish review procedure

A mechanism for learning lessons, both positive and negative, from past projects, should be established, the lessons then being built in to procedures, training events etc. for subsequent projects.

Design changes

Design teams must be given the freedom to develop ideas, test and evaluate designs before they are approved. Once the design is approved, however, design changes must be rigorously controlled through an effective change control procedure which should only permit essential changes. Criteria which define essential changes should be drawn up for each project. Essential changes would normally be confined to those changes which, if not implemented, would result in the project objectives not being achieved. All potential design changes should be subjected to rigorous scrutiny to determine whether they meet the criteria as an essential change.

Auditing

If the design process is registered as a Quality Assured procedure under ISO9000, regular audits will be required to assure compliance with design procedures. In addition, it is good practice for the design process to include regular audits in such areas as technical compliance, safety reviews and hazard identification.

Workbook Cross References

VEP 1.2	Project Definition and Objectives
VEP 1.5	Safety, Health and Environment
VEP 2.1	Project Team Organisation
VEP 4.1	Information Management
VEP 6.1	Continuous Improvement
VEP 6.2	Innovation and Intellectual Property
VEP 7.3	Constructability
VEP 7.4	Standards and Specifications
VEP 8.1	Performance Benchmarking

Further Reading

CII VA002. Evaluation of Design Effectiveness. Video.
CII 8-1. Evaluation of Design Effectiveness. Research summary.
CII 8-2. Input variable: Impacting Design Effectiveness. Research Summary.

For CII contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 7.2 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

7.2-A Technical Audit Check List: Process Engineering
7.2-B Technical Audit Check List: Mechanical Engineering
7.2-C Technical Audit Check List: Electrical Engineering
7.2-D Technical Audit Check List: Instrument Engineering
7.2-E Technical Audit Check List: Civil Engineering
7.2-F Technical Audit Check List: Architectural Engineering

ACTIVE VALUE ENHANCING PRACTICE

No. 7.2 DESIGN EFFECTIVENESS

ATTACHMENT 7.2-A

TECHNICAL AUDIT CHECK LIST

PROCESS ENGINEERING

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TECHNICAL AUDIT CHECK LIST

PROCESS ENGINEERING : CONCEPT DESIGN/FEASIBILITY PHASE

Project Title: **Project No:**

Auditor: **Date:**

Purpose of Audit:

Activity	Audited	Issue	Ref	Comment
Concept Options				
Process Definition				
Block Diagram				
Process Design Basis				
Process Flow Diagram(s)				
Operating Philosophy				
Mass Balance				
Heat Balance				
Equipment List - Registration Details - Process Details				
Equipment Data Sheets				
Calculations				
Control Philosophy				
Utilities Summary				
Electrical Loading Summary				
Hazardous Area Classification - Basis - Drawing				
Layout Review				
Design Safety Review 1				
Hazard Study 1				
Basis of Safety				
Design Safety Review 2				
Hazard Study 2				
Risk Assessment				
Other				

ACTIVITY CHECKLIST

Audit Ref No: .... **Auditor:** ....

Activity	**Components**	**Audited**
Concept Options	Derivation Analysis Conclusion	
Process Definition	Basis Uncertainties	
Block Diagram	Content Clarity	
Process Design Basis	Process Route Novel Areas/Uncertainties/Problems Capacity/Turndown/Design Margins Raw Materials Specification/Supply Product Specification/Disposal Utility Supply Data Effluents Generated/Management Philosophy Materials of Construction Philosophy Control and Instrumentation Philosophy Chemical Hazards Sources of Physical and Chemical Data Design limitations imposed by Client Approval	
Process Flow Diagram	Layout Content Clarity Checking/Approval	
Operating Philosophy	Normal Operation Normal Start-up Normal Shutdown Initial Start-up Emergency Shutdown Utility Failure Approval	

Activity	**Components**	**Audited**
Mass Balance	Layout Content Clarity Accuracy Checking/Approval	
Heat Balance	Layout Content Clarity Accuracy Checking/Approval	
Equipment List - Registration Details - Process Details	Item Numbering Philosophy Packages HVAC Hoists/Showers/Hose Points etc. Sparing Completeness Checking/Approval Accuracy Completeness Checking/Approval	
Equipment Data Sheets	Accuracy Completeness Checking/Approval	
Calculations	Layout/Format Readibility Accuracy Checking/Approval	
Control Philosophy	Control and Safety Systems Strategy Control system(s) - Hardware - Software - Operability Safety System(s) - Hardware - Software - Operability Instrumentation Philosophy	

Activity	Components	Audited
Utilities Summary	Diversity Start-up/Shutdown/ESD Format Completeness Accuracy Checking/Approval	
Electrical Loading Summary	Format Completeness Accuracy Checking/Approval	
Hazardous Area Classification - Basis - Drawing	Flammables Register Gas Group/Temp Class Combustible Dusts Design Code/Schedule QA Procedure Blanket Zoning Document Structure Completeness Approval Plan Elevation Clarity Checking/Approval	
Layout Review	Major Equipment Location Floor Level Philosophy Separation “Corridors” Plans/Elevations Bunding/Containment Equipment Withdrawal Pipe Routing Operator Access Maintenance Access Dead Legs/Lutes Self Draining Valve Access (Operator + Maintenance) Control and Instrumentation Location Vents Location Drains Location	
Design Safety Review 1	Issues Arising Close Out	

Activity	**Components**	**Audited**
Hazard Study 1	Issues Arising Close Out	
Basis of Safety	Major Hazard Areas Prevention/Protection Approval	
Design Safety Review 2	Issues Arising Close Out	
Hazard Study 2	Issues Arising Close Out	
Risk Assessment	Areas Requiring Assessment Methodology Accuracy/Sensitivity Approval	
Fluids List	Design Temp. and Pressure Materials Relevant Fluids Pressure Regulations Approval	

P&ID(s)	Title, Issue No. etc.
	Layout/Line routing
	Item Numbering/Identification
	Amendment Register
	Relieving Devices
	    Set Point
	    Destination
	Sample Points
	    Location
	    Detail
	Critical Elevations
	Line Sizes
	Nozzle Sizes
	Spare Branches
	Maintenance Vents and Drains
	High and Low Point Vents and Drains
	Showers
	Hose Points
	Drainage/Effluent Collection
	Drip Trays
	Tundishes
	Manways
	Overflows
	Instrument Location
	Local/Remote Instrumentation	

Activity	Components	Audited
P&ID(s) continued	Control Logic Trip Initiators Weigh Cells/No. off/Flexibles Earthing Valve Type Specials	
Package Equipment	Definition/Boundary Clarity of Process Information Co-ordination Checking/Approval	
Critical Line List	Definition Approval	
Instrument Data Sheets	Normal/Design Temp & Pressure Range Position Failure Mode Valve Class Pressure Drop	
Trip Schedule	Soft Wired/Hard Wired Sequenced Trips Approval	
Relieving Device Schedule	Design Basis Set/Back Pressure/Range Design Code/Design Case Vacuum Support Breather/Conservation Valves Manifold Checking/Approval	
Vent Schedule	Design Basis Flame Traps Emission Point Back Pressure Manifold Checking/Approval	
Utilities Requirements	Utility P&IDs Basis of Sizing/Diversity Pipework Design Calculations Checking/Approval	
Technical Bid Analysis	Key Equipment Contribution	
Design Safety Review 3	Issues Arising Close Out	
Hazard Study 3 (HAZOP)	Issues Arising Close Out	

ACTIVE VALUE ENHANCING PRACTICE

No. 7.2 DESIGN EFFECTIVENESS

ATTACHMENT 7.2-B

TECHNICAL AUDIT CHECK LIST

MECHANICAL ENGINEERING

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TECHNICAL AUDIT CHECK LIST

MECHANICAL ENGINEERING

Project Title: **Project No:**

Auditor: **Date:**

Purpose of Audit:

	Concept	AFC/ Order	As-Built
1. SPECIFICATIONS 1.1 Packaged Plant [list packaged plant work packages]			
1.2 Vessels [list vessel work packages]			
1.3 Pumps [list pump work packages]			
1.4 Agitators [list agitator work packages]			

	Concept	AFC/ Order	As-Built
1.5 Materials Handling [list material handling work packages]			
1.6 Heat Exchanger Specifications [list heat exchanger specifications]			
1.7 PPS			
1.8 Installation [list installation work packages]			
2 P&Ids 2.1 Process [list P&ID's by area]			

	Concept	AFC/ Order	As-Built
2.2 <u>Services</u> [list P&ID's by area]			
3 <u>BLOCK LAYOUTS</u> [list layouts by area]			
4 <u>PLANT LAYOUTS</u> [list layouts by area]			
5 <u>PIPING/DUCTWORK GA's</u> 5.1 <u>Pipework GA's</u> [list layouts by area]			
5.2 <u>Ductwork GA's</u> [list layouts by area]			

	Concept	AFC/ Order	As-Built
6. <u>CO-ORDINATION DRAWINGS</u> [list CD's by area]			
7			
8			
9 <u>FIRE PROTECTION</u> 9.1 <u>Sprinklers</u> [list area]			
9.2 <u>Inert Flooding</u> [list areas]			

	Concept	AFC/ Order	As-Built
9.3 Foam Systems [list areas]			
10 HVAC 10.1			
11 CLEAN ROOMS			

MECHANICAL PACKAGED PLANT CHECK LIST

1.0 Definition

An assembly of various items of plant, equipment, instruments, control panels and/or pipework/cabling arranged to operate collectively to provide a product or service. The package shall be purchased on one purchase order from one supplier. The supplier shall where practical be made responsible for the satisfactory operation of the package, with appropriate performance tests/guarantees included.

2.0 Typical Packages

Air Compressor Packages (skid mounted)
Baking Oven
Baling Press
Boilers
Chiller/Refrigeration Plant
CIP
Conveyors
Crimpers
Dust Handling Systems
Effluent Treatment Package
Electric Fluid Heaters
Filter Press
Furnace
Gas/Steam Turbines
Goods/Personnel Lift
HVAC
HVAC System
Oven
Packaging Line
Packaging Equipment
Pneumatic Conveying Systems
Power Generation Equipment
Refrigeration Unit
Rotary Vacuum Filter
Skid Mounted Systems
Solvent Recovery Package
Spinning Machines
Tensioners
Water Treatment Plant
Weighing Systems

MECHANICAL CHECK LIST OF CONCEPTUAL DESIGN ISSUES

Objective
Programme/Budget
Outline Process Specification
PFD
Occupancy of Process/Office Areas
Detail Process Specification
- Client deliverables/products
- Client raw materials
- Performance guarantees
- Emissions
- Operating philosophy
- Degree of automation
- Physical properties of fluids and solids

Site Details
- Noise details
- Size
- Location
- Condition
- Planning

P&ID - Stage I
Block Layout
HAZOP Results
Nominated Equipment/Suppliers
Client Specifications/Standards/Procedures
Agreed Project Standards, Codes of Practice
Identification/Classification of Hazardous Areas
Details of Free Issue Equipment
Description of Interface with Existing Plant
On Site Services Details
Building Environmental Conditions
Project Co-ordination Procedure
Design Safety Review Part I

MECHANICAL CRITICAL DESIGN CONCEPTS

Sample Point Design
Loadcell Mounting/Installation
Relief Valves Installation/Venting
Bursting Disc Installation/Venting
Pipe Supports/Anchors
Pipe Bridges
Ergonomics
Pump Installations
Horizontal Vessel Mounting
In-Line Equipment Installation
- Instruments
- Control Valves
- Sight Glasses

Boiler/Multiple Boiler Installation
Compressed Air Distribution Design
- Falls
- Traps
- Drains

Steam Distribution Design
- Falls
- Traps
- Drains

Safety
- Manway Design/Positioning
- Walkways
- Handrails
- Kicking strips
- Ladders
- Platforms
- Bursting Discs
- Relief Valves

ACTIVE VALUE ENHANCING PRACTICE

No. 7.2 DESIGN EFFECTIVENESS

ATTACHMENT 7.2-C

TECHNICAL AUDIT CHECK LIST

ELECTRICAL ENGINEERING

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TECHNICAL AUDIT CHECK LIST

ELECTRICAL ENGINEERING

Project Title: **Project No:**

Auditor: **Purpose of Audit:** **Date:**

	Approved Concept	Enquiry/ AFC	Site
<u>Input Data from Others</u>	Initial Data	Firmed-Up Data	Working Details & Records
Contract & Estimate 4.1, 4.2, 4.8 (includes scope, design standards, norms and preferred suppliers)			
Basic Information 4.3, 4.4, 4.11 (includes flowsheets, room data sheets, kW ratings, schedules)			
Hazardous Area Classification 4.6 (includes schedules and zoned layout drawings)			
Plant Arrangement, Equipment and Piping Layouts 4.9 (includes plant design, services, B&CE, architect)			
Plant Package Specs 4.12, 4.14 (requiring electrical text & input)			
Co-ordination Drawings 4.10			
Trace Heating Requirements 4.13 (including data sheets and ISO's)			
Trip Schedules 4.5			
Levels 1, 2 & 3 Programmes (includes details of fixes at installation)			
S Curves for Resource Requirements			
Drive Facilities 4.7 (VS drives, 2 speed drives, VS gearbox drives)			

Project Title: **Project No:**

Auditor: **Date:**

	Approved Concept	Detailed Design (Drgs = Schematics, layouts, SLDs & CDLs)	Site
<u>Electrical Activities</u> Site Temporaries Main Incoming HV/LV Power Supplies (supply authority involvement) Main Distribution Equipment Part 5.4 (HV S'boards, LV S'boards, power transformers) Other Long Lead Time/Delivery Items (lifts) Part 5.4 Power Factor Correction Substation/Switchroom Electrical Requirements Part 5.9 HV/LV Power System Calcs Part 5.15 (fault level, protection, discrim from HV/LV and lighting) Power Generation Facilities (essential/standby/base load systems) Provision of Secure Power Supplies (UPS, battery back-up, trip/close supplies) Starter Panel Schemes 5.13 (including schematics)	Estimate & Initial Data	Spec & Drg & Sched & Calcs & BA & Order	Equipment & Install Records

	Approved Concept	Detailed Design (Drgs = Schematics, layouts, SLDs & CDLs)	Site
VS Drive Systems 5.10			
Motor/Power User Specs & Data Schedules 5.3, 5.3			
Power Layouts and Cable Routes (mains supplies, process and services layouts & cabling) 5.17 (c)&(d)			
Lighting and Earthing Schemes (including luminaire schedules) Pt 5.14, 5.15			
Small Power Layouts Part 5.14 (including sockets, battery charging, equipment schedules)			
Security Systems/PA/Communication Layouts Part 5.14			
Trace Heating Systems 5.18			
Single Line Diagrams & Diagrams of Connections 5.17 a & b			
Electrical Installation Specification 5.17f (equipment by contractor, area, clean areas etc)			
Fire Alarm Schemes Part 5.14 (including smoke and heat detection)			
E&I/C Interface (including marshalling boxes)			
Electrical Activity Programmes 5.17c (including installation programmes)			
Design Safety Reviews & Technical Audits (Parts 2, 3, & 4 SR and milestone audits)			
Room Data Sheet compilation 5.11			
Electrical Input to Plant Package Specs 5.7			

CLIENT CHECK LIST

ELECTRICAL ENGINEERING

Project Title: **Project No:**

Auditor: **Date:**

	Date Required	Signed	Date Received
1. Electrical Supply Details a) Voltage b) Frequency c) Maximum demand d) Power factor e) Spare power capacity f) Location of main sub-station g) Fault level at main sub-station h) Protection settings 2. Security of Electricity Supply a) Outage frequency b) Average duration 3. Electricity Supply Company a) Name b) Address c) Contact 4. HV Switchgear a) Existing switchgear i) Manufacturer/type/rating ii) Fault rating b) Preferred manufacturer/type for any new switchgear requirements 5. LV Switchgear a) Existing main switchgear i) Manufacturer/type/rating ii) Fault rating iii) Fault level			

	Date Required	Signed	Date Received
b) New Preferred manufacture/type/ colour for any new switchgear requirements 6. <u>Transformers</u> a) Existing i) Rating ii) Impedance % iii) Insulation medium iv) Vector group v) Location, indoor/outdoor b) New Preferred manufacture/type for any new transformer requirements 7. <u>Motor Control Centre</u> a) Existing i) Manufacturer ii) Fault rating iii) Spare capacity available b) New Preferred manufacture/type/ colour for any new motor control centre requirements 8. <u>Distribution Boards</u> a) Existing i) Type/manufacturer ii) Spare capacity b) New Preferred manufacture/type/ colour for any new distribution board requirements 9. <u>Local Starters</u> a) Existing i) Type/manufacturer b) New Preferred manufacture/type for any new local starter requirements			

10. <u>Variable Speed Drives</u> a) Existing i) Type/manufacturer b) New Preferred manufacture/type for any new local starter requirements c) Duty cycle/type of load 11. <u>PF Correction</u> Existing i) Manufacture/type ii) Rating iii) Automatic or manual control 12. <u>Motors - Fixed Speed</u> a) Any known restriction on maximum size for starting DOL b) Preference for manufacturer/type 13. <u>Motors - Special</u> a) Details of any special requirements 14. <u>Lighting</u> a) Normal i) Details of any specific lighting levels required ii) Details of any special environmental conditions including hazardous areas iii) Types of luminaire presently installed b) Standby i) Details of standby lighting requiredii)Source of power to stand-by lighting iii) Control of standby lighting c) Emergency i) Type of luminaire presently installed ii) Central or self-contained battery power source			

d) External i) Type of luminaire presently installed 15. <u>Socket Outlet Systems</u> a) Systems required and location i) 13A Ring Main 240V single phase ii) BS 4343 Socket 32A 415V 3 phase + N iii) BS 4343 Socket 16A 240V single phase iv) BS 4343 Socket 16A 110V single phase v) BS 4343 Socket 16A 50V single phase vi) Other 16. <u>Cabling - Type Installed/Preferred</u> a) Mains i) HV ii) LV iii) Control iv) Special 17. <u>Fire Detection Systems</u> a) Present System i) Manual or automatic ii) Conventional or addressable iii) Location of main fire panel iv) Manufacturer of system b) New system preferences i) Manual or automatic ii) Conventional or addressable iii) Interlocks with other systems 18. <u>Security Systems</u> a) Systems required/details of areas to be covered i) CCTV ii) Door access iii) Intruder alarm			

19. <u>PA Staff Location</u> a) System required/details of areas to be covered 20. <u>Services Packages</u> a) Packages required - List b) Duties 21. <u>Telephones</u> a) System required i) BT ii) Mercury iii) PABX iv) Other 22. <u>Power Earthing/Static Earthing</u> a) Power Earthing i) Details of any existing main earth system ii) Recorded measurements for main earth nest resistance and system earth loop impedances b) Static Earthing i) Details of any existing static earthing systems ii) Details of any new plant/ equipment which will require static earthing 23. <u>Lightning Protection</u> a) Details of any existing lightning protection systems b) Details of any known specific requirement for lightning protection			

24. <u>Battery Charger/Trip Units</u> a) Preferred manufacturer/type for any new requirements 25. <u>UPS Systems</u> a) Details of any specific requirement b) Preferred manufacturer/type for any new requirements 26. <u>Trace Heating</u> a) Details of any specific requirement i) Item(s) to be heat traced (e.g. pipeline) ii) Purpose of tracing, frost protection, temperature maintenance, process start-up 27. <u>Lifts</u> a) Passenger i) Capacity - No. of passengers ii) Number of floors to be serviced iii) Total travel distance required iv) Details of any special finishes required b) Goods i) Capacity - kg ii) Required floor area of car iii) Required minimum internal height of car iv) Number of floors to be serviced v) Total travel distance required vi) Automatic or manually operated doors required 28. <u>Hazardous Area Classification</u>			

a) Details i) List of hazardous areas and classification ii) Hazardous area drawing showing full extent (including height) of each zoned area 29. <u>Clean Area/GMP Requirements</u> a) List detailing each room/area 30. <u>Client's Drawing Standards</u> a) Copy of relevant standards 31. <u>Client's Specifications</u> a) Copy of each relevant standard 32. <u>Client's Preferred Suppliers</u> a) List of preferred suppliers 33. <u>Miscellaneous</u> a) Any other relevant information			

ACTIVE VALUE ENHANCING PRACTICE

No. 7.2 DESIGN EFFECTIVENESS

ATTACHMENT 7.2-D

TECHNICAL AUDIT CHECK LIST

INSTRUMENT ENGINEERING

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TECHNICAL AUDIT CHECK LIST

INSTRUMENT ENGINEERING

Project Title: **Project No:**
Auditor: **Purpose of Audit:** **Date:**

Control System Conceptual Design Issues

1	Control System Selection: Issues:	
2	Batch or continuous complex batch seq?	
3	CHAZOP required?	
4	Recipe handling SP88 required FDA or MCA approval?	
5	Hazardous area? Zone 1 or 2 galv. Isol. or zenners?	
6	Batch Reports Electronic Signatures	
7	(24 hr/365 day) operation times	
8	Centralised or local operation (operator involvement)	
9	I/O signals Valve 1 or 2 Motor 2 or 3	
10	Safety Critical System Required?	
11	Fault Tolerant/Redundancy PS, I/O, Processors Highway (Availability)	
12	UPS Power Req. (Load & Time)	
13	Overview Diagram Prepared	
14	Remote I/O Plant Mounted I/O Cubicles	
15	“Field Bus”/HART requirement	

Package Plant (General)

1	Establish Scope of Supply & Installation of each Package	(Scope Chart vs. Package Prepared?)
2	Vendor List (Preferred/Rec. Suppliers) Available	
3	Purpose Built/Design Package or Off-the-Shelf	
4	Client Standards to be Passed On?	
5	Model Spec. Standards used	
6	Check Documentation Lists for Requirements (Schedules, Specs, Drgs.)	
7	Check Ownership of Purpose Written Software - Should be Client	
8	Check Programme for Information Dates (Design Info.)	
9		
10		
11		
12		
13		
14		
15		

Key Co-ordination Drawings

1	Control Room Location(s)	
2	CR : Check 'System' Overall Size Against Room Size	
3	Auxiliary Room Location(s)	
4	Aux : Check Size Against Number of Expected Cubicles	
5	Local Panel and Floor Standing JB's Check Location/Clearances	
6	Major Cable Route Corridors	
7	Major Holes in Floors (150mm Dia. & Larger)	
8		
9		
10		
11		
12		
13		
14		
15		

Control System Specifications

1	Check Model Specs used for URS & Scope of Works (SoW)	
2	Check List of Inclusions & Exclusions in SoW	
3	Check Programme & Adequacy of FDS Period (Typical = 12+ wks)	
4	Check Validation if FDA/MCA Change Control/Error Control/Test Plans	
5	Detailed Read Through of URS	
6	Check System Block Diagram	
7	Check Annexes for Process Description	
8	I/O Listing	
9	Hardwired/Software Trip Actions	
10	Mimic Details	
11	Report Details	
12	Check Payment Terms Against Deliverables	
13	Check Purpose Written Application Software Ownership	
14		
15		

Field Instrumentation Specifications

1	Cross Check Measurement Types Selected Against P&ID	
2	Cross Check if Valves Following Pipe Spec.	
3	Random Checks on Connection Sizes Against Mech. Data Sheets (Inst. Specs. vs. Vessels)	List….
4		List….
5	Random Checks on Process Data on Mech./Process Data Sheets vs. Inst. Specs.	List….
6		List….
7	Check Hazardous Area Data, (Against H.A.Drg) on Specs.	
8	Check Accuracy(s) Specified Against Contract Requirements	
9	Check Outputs Specified	
10	Check Primary & Secondary Data for Completeness	
11	Check Materials for Possible Corrosion Problems	
12	Check Current Client Standards Available & Used by 'Spec. Engineers'	
13		
14		
15		

Installation Concept

1	Concept Prepared	
2	Client Standards Installation?	
3	JB's Required & Locations, Typical Multicore Numbers	
4	JB Segregation/Split 24V / 110V / 4-20mA	
5	Cable Route Types Trunking / Tray / Ladder	
6	Cable Type Armoured, Screened, Low Smoke, MICC	
7	Signal Separation within Cables (Mixing)	
8	Segregation of Signal, Pneumatic, Data Cables Req?	
9		
10		
11		
12		
13		
14		
15		

ACTIVE VALUE ENHANCING PRACTICE

No. 7.2 DESIGN EFFECTIVENESS

ATTACHMENT 7.2-E

TECHNICAL AUDIT CHECK LIST

CIVIL ENGINEERING

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TECHNICAL AUDIT CHECK LIST

CIVIL ENGINEERING

Project Title: **Project No:**

Auditor: **Purpose of Audit:** **Date:**

• Resource		
• Foundations/Piling		
• Reinforced Concrete		
• Steelwork		
• 2º Steel		
• Surveys		
• Calculations		
• Drawings		
• Specifications		
• Co-ordination		
• Stairs		
• Standards/ENGCOPS		
• CAD		
• Change Control		
• Cost of Works		
• Manhours		

APPROVALS

COMMENTS:

Signed ....   Date ....

CIVILS AUDIT CHECK LIST

	Approved Concept	Enquiry/ AFC	Site
1. <u>General</u> Demolition Site Clearance Topographical Survey Geotechnical Survey Contamination Report Drainage Survey Materials Survey Level Floor Survey Planning Submission Building Regs Submission Calculations Specifications Drawings			
2. <u>Foundations</u> Piles Pile Caps Ground Beams Floor Slab (r.c.) - inc slopes Equipment Bases Strip Footings Column Bases Ducts Bunds Sumps/Drains Plinths Floor Channels Pits Raised Loading Dock			
3. <u>Superstructure</u> a) Steelwork Frame Floors - inc slopes Holes Protective Coatings Fire Protection Platforms Stairs/Ladders Roof Secondary			

	Approved Concept	Enquiry/ AFC	Site
b)Reinforced Concrete Frame Floor Slab - inc slopes Walls Roof Holes Stairs Bunds Channels Sumps Finishes Plinths c) Other Brick/Blockwork Walls Access Flooring Holes Builders Work			
4. Civils/Infrastructure Drains - Surface Water - Foul - Effluent Retaining Walls Roads Layouts Weighbridge Bunds Pits Sumps Trenches Pipebridges Pipebridge Foundations Equipment Bases Loading/Unloading Platforms			
5. Buildings Building A Building B Building C, etc.			

CIVILS CONCEPTUAL DESIGN ISSUES
(within 4 weeks of award)

1. Client design standards/specifications.
2. Client site services drawings.
3. Client site drawings.
4. Client geotechnical data (inc. mining and seismic)
5. Client ground contamination data for site.
6. Client supply equipment drawings.
7. Client contamination disposal requirements.
8. Site restrictions imposed by statutory authorities.
9. Previous planning and environmental restrictions.
10. Tender and contract requirements.
11. Client approval requirements - drawings and documentation.
12. Agreement of ITT and amendments.
13. Loading criteria if different from BS.
14. Deflection criteria.
15. Where load cells are required.
16. Agreed layout (site).
17. Agreed floor layouts.
18. Agreed materials.
19. Agreed performance (materials and structure) requirements.
20. Fire protection and compartmentation requirements.
21. Plinth heights and finish.

22. Lifting beam requirements (temporary and permanent).

23. Requirements for access platforms (where and to what, i.e. valves, instruments, manways, sight glasses, etc).

24. Pipebridges (connection points, headroom, tiers, access walkways, structural form, deflections, etc).

25. Floor slopes.

26. External works (tie-ins, road loading spec, black top/concrete/other, kerbs, signs, markings, barriers, fencing etc).

27. Acid resisting tiles (15 or 35mm, furane, plinth/base details, stanchion details).

28. Flooring (chequer plate/open grating/other, MS/SS/Al/other).

29. Chemical listing.

30. Coatings (flooring, splashing/wet areas/fume, refurbished areas, galvanised areas).

31. Bunds (height, finish, sealants, to BS 8007, handrails, platforms, access/egress requirements, clearances, drainage, sump).

32. HD bolts (material, client/supplier supply).

33. Venting and explosion requirements and specification.

34. Earthing requirements.

35. Lightning protection details.

36. Lift requirements.

37. Vehicle and vehicle movements.

38. Warehouse loading docks (level/raised).

39. Critical and milestone dates (CE & Client targets).

40. Foundation philosophy.

ACTIVE VALUE ENHANCING PRACTICE

No. 7.2 DESIGN EFFECTIVENESS

ATTACHMENT 7.2-F

TECHNICAL AUDIT CHECK LIST

ARCHITECTURAL ENGINEERING

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TECHNICAL AUDIT CHECK LIST

ARCHITECTURAL ENGINEERING

Project Title: **Project No:**

Auditor: **Purpose of Audit:** **Date:**

	Approved Concept	Enquiry/ AFC	Site
1. <u>Lead Architect's Informal Weekly Audit</u> a) Safe design progress b) Programme c) Manhours d) Workload e) Drawing issues f) Issue of reports g) Issue of technical studies h) EOI's i) Variations to contract j) Conformity to brief k) Conformity to CE standards			
2. <u>Chief Architect's Formal Monthly Audit</u> a) Is Lead Architect checking weekly b) Compliance with: 1) Client/user brief 2) Legislation - Planning Authority 3) Local Acts of Parliament c) Are corrective actions underway d) Problems and difficulties e) Safe design f) Conceptual design g) Issue of technical information/reports/ permission 1) Specifications 2) Building Regulations 3) London Building Act 4) Fire precautions 5) Health and Safety at Work Act 6) Control of substances - COSHH 7) Survey 8) Calculations 9) Layout drawings			

	Approved Concept	Enquiry/ AFC	Site
10) Schedules 11) Standards and Codes 12) Package specifications 13) Operability and maintainability 14) Room data sheets 15) Material specifications 16) Filing systems 17) Fire studies/compartments 18) Phasing of construction 19) Movement control 20) Material compatibility 21) Rainwater disposal 22) Selected manufacturers 23) Finishes 24) Client standards 25) Safety in use revisions 26) Manhour Control 27) Programme Items i) Internal Environment ii) External Environment 28) Information Briefs i) Internal Environment ii) External Environment 29 CAD i) Internal Environment ii) External Environment 30) Drawings issues 31) Location of DPC's 32) Explosions 33) Deflagration 34) Disabled access 35) Lift types 36) Water table 37) Site datum and grid 38) Use of enhanced NBS 39 Use of standard details			

	Approved Concept	Enquiry/ AFC	Site
h) Approval status 1) Client 2) Planning 3) Building Regulations 4) Fire 5) Other 6) Insurance i) Technical studies 1) Structural options - cost studies 2) Sound calculations 3) Thermal calculations 4) Drainage 5) Discharges 6) Stability of walls 7) Roof access 8) Window cleaning 9) Means of escape 10) Vehicle parking/roads 11) Materials - cost studies 12) CE Standards			
3. <u>Term Audit by Agreement</u> a) Information to be prepared by Lead Architect for all discipline audit b) Safety c) Buildability d) BWIC e) Common brief f) Problems g) Overlap areas h) Programme i) Staffing			
4. <u>Site Audit by Chief and Lead Architects</u> a) Conformity with Contract b) Target areas - refer to Clerk of Works Handbook c) Safety d) Datum e) Setting out f) Access g) Materials on site			

	Approved Concept	Enquiry/ AFC	Site
h) Location of DPC's i) Quality of construction j) Method of construction k) Competence of site inspectorate l) Progress m) Programme n) Problems o) Visits to site by LA and other agencies			

ACTIVE VALUE ENHANCING PRACTICE

No. 7.3 CONSTRUCTABILITY

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ACTIVE VALUE ENHANCING PRACTICE

No. 7.3 CONSTRUCTABILITY

Purpose and Benefit

Application of ACTIVE VEP 7.3 will assist in meeting project goals by improving the construction phase of project execution. Constructability is the optimising of constructionknowledge and experience of the team, and integrating this in a timely manner into the planning, design, procurement and field operations phases of the project.

Essential Activities

- Commit to include constructability as a key component of the project strategy.

- Undertake constructability reviews and studies during conceptual planning, design, procurement and construction phases, recognising previously established best practice and lessons learned. Develop construction programmes that reflect project handover, commissioning and start-up requirements.

- Assess constructability ideas for impact on safety, quality, programme and cost, implementing initiatives where these further project objectives. Record lessons learned and best practices for use on future projects

The Essential Activities are discussed in more detail in the following Guidelines for Implementation. A constructability check list for the project execution phase is included in Attachment 7.3-A.

Guidelines for Implementation

7.3.1 Guidelines for Project Constructability Programme

The project strategy should clearly state the intention to implement a constructability programme. Commitment to this strategy by the project team should be enlisted through positive leadership, clear goal setting, effective procedure development, training and support.

Constructability must be addressed at the outset of a project as required by legislation, including the Construction (Design and Management) Regulations 1994.

Key constructability activities should be identified and planned into the project programme, with a construction manager being appointed early in the project development phase to work with the project definition and design teams to ensure constructability is fully addressed. The project execution plan should incorporate key constructability events including a constructability close-out review towards the end of the project.

An effective constructability programme requires, as a minimum, the following actions during the successive phases of the project:

During the conceptual planning phase

- Constructability requirements should be built into the project execution plan
- Initial project planning should take account of construction knowledge and experience
- Contract strategy development should involve early construction input
- Conceptual and detailed design should incorporate an effective construction methodology
- Plant site layout development should facilitate efficient construction activities

During the design and procurement phases

- Design and procurement schedules must take account of construction requirements
- Design configuration must allow for efficient construction
- Standardised designs and specifications will assist with simplified procurement and construction
- Considering modularisation and pre-assembled units may assist fabrication, transportation and installation
- Construction access should be provided at the design stage, including areas for storage, materials laydown and site offices.

During the construction phase

- Design engineers should be involved in construction activities to help deal with problems.

7.3.2 Guidelines for Constructability Reviews

Constructability reviews should involve all relevant participants, including personnel from design, planning, procurement, construction, commissioning, operations, vendors, and contractors, plus specialist information and service providers. It is important to recognise, that as with all value management activities, the potential for achieving improved constructability results is highest at the outset of a project and reduce as the project progresses toward the construction phase.

Reviews should be undertaken early during each key project phase as pro-active events seeking to ‘design in’ positive ideas, and not as reactive responses attempting to ‘design out’ weaknesses.

Best practice, lessons learned, and construction knowledge and experience from previous project constructability initiatives, should be used to optimise the planning and design of the current project. New ideas and innovation should be encouraged, controlled, recorded and assessed in the context of continuous improvement. Specific constructability studies, identified by the project and constructability teams, should be conducted, with the results subsequently assessed for overall project benefit.

Construction contractors selected for the project should be assessed on their strengths and weaknesses, their capabilities and competence levels. Contractor strengths should be integrated into design, procurement and construction plans, while awareness of and appropriate allowance for weaknesses should be made. This is only possible if construction contractors are identified and appointed at an early stage of the project.

Contractors should be encouraged to participate in the constructability programme and contribute to constructability reviews, studies, ideas and initiatives. This will maximise the benefits of contractor expertise, ensure ideas and initiatives are practical, and obtain contractor ownership and commitment within the project team.

7.3.3 Guidelines for Constructability Ideas and Initiatives

All relevant constructability ideas generated throughout the project should be recorded and assessed for their contribution to the project. A structured listing of ideas should be developed and reviewed for impact on the project. Ideas found to be of overall project benefit should be actioned as constructability initiatives and implemented at the appropriate project phase.

Throughout the project, constructability initiatives should be fully planned, controlled and monitored against their expected returns and impact. Only by tracking initiatives can their actual worth be measured and assessed for overall benefit to the project. Tracking should be made against objective measurements and targets as far as possible.

Planning, design and procurement activities should consider and reflect the construction programme developing within the project. This will assist with attaining a functional design, permitting material and equipment to be supplied to specification while at the same time supporting effective construction in terms of time, cost, quality and safety. The construction programme should also reflect the project's commissioning and start-up requirements.

A master database should be compiled, recording proven best practice for implementation on future projects. Lessons learned through the implementation of various project constructability initiatives should also be recorded in the master database to provide guidance and insight. In addition to the positive gains achieved through the constructability programme, any unsuccessful initiatives should also be reviewed as part of the lessons learned process, for perceived causes of failure.

Workbook Cross References

VEP 1.2	Project Definition and Objectives
VEP 1.5	Safety, Health and Environment
VEP 7.1	Project Control
VEP 7.2	Design Effectiveness
VEP 7.4	Standards and Specifications
VEP 7.5	Project Handover and Commissioning

Further Reading

CII SP34-1. Constructability Implementation Guide. Research summary and case studies.
CII VC-114. Implementing a Constructability Programme. Video.
CII EM-11. Project Constructability. Training Package.

For CII contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 7.3 originated with the Effective Project Execution Workgroup. Refer to Section 5 for contact details.

Attachments

7.3-A Constructability Check List for Project Execution

ACTIVE VALUE ENHANCING PRACTICE

No. 7.3 CONSTRUCTABILITY

ATTACHMENT 7.3-A

CHECK LIST FOR PROJECT EXECUTION

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ATTACHMENT 7.3-A

CHECK LIST FOR PROJECT EXECUTION

The following check list relates to constructability input and methodology during project execution.

1. Ensure design, procurement and contracting schedules are construction sensitive. They must incorporate a balance between design, equipment and construction costs and quality.

- Design work packages to be consistent with the construction contracting strategy
- Design sequence to support the desired construction methodology
- Design freeze points to be compatible with equipment supply and construction activity start points
- Schedule procurement to match site delivery, storage and installation needs
- Ensure contracting arrangements define contract form, terms and conditions, scope, responsibilities and communications
- Develop commissioning programme early in the project to drive system and area completion

2. Configure design to promote efficient construction.

- Outline construction methodology early in the detailed design phase to ensure incorporation into design (access, construction plant, site temporaries, sequence)
- Design construction site access and layout to achieve construction safety, efficiency (logistics), quality and overall value
- Design construction aids, for example, beams, lugs, gantries, lift wells, removable sections, and services, to help installation, operation and maintenance
- Ensure site conditions, including climatic and logistic factors, are reflected in construction schedule
- Consider lift and access requirements (time, cost and safety) for equipment berthing
- Consider pre-assembly and pre-fabrication to reduce onsite manning

3. Use standardised designs and specifications for simplifying procurement and construction.

- Use previous designs and specifications where appropriate to avoid unnecessary effort and repetition
- Select components for commonality - fittings, connections, supports, sizes, specifications
- Standardise installation methods and tolerances to reduce training and supervision
- Build in on-site adjustment and tolerance where appropriate

4. Consider modularisation to assist fabrication, transportation and installation.

- Use preassembled units (PAUs) or modules which offer time, cost or quality benefits
- Adopt fabrication shop testing, inspection and validation to improve efficiency and quality
- Reduce site installation durations by using PAUs and modules.

5. Design for construction access for personnel, materials and equipment.

- Locate off loading and storage to avoid traffic and construction disruption
- Locate site accommodation and facilities to minimise non productive labour time
- Improve safety of installation operations by segregation of access routes
- Minimise disruption of installation operations by co-ordinating access routes for people, plant and equipment
- Provide timely supply to avoid excess storage by control of material storage and flow
- Maintain effective site conditions by removing waste from work areas
- Minimise environmental impact and work face congestion by careful location of plant and equipment

ACTIVE VALUE ENHANCING PRACTICE

No. 7.4 STANDARDS AND SPECIFICATIONS

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ACTIVE VALUE ENHANCING PRACTICE

No. 7.4 STANDARDS AND SPECIFICATIONS

Purpose and Benefit

ACTIVE VEP 7.4 addresses the definition and use of standards and specifications which focus on functionality, with minimum prescription, as a means of clearly defining the relevant requirements for products and services. This approach will bring benefits to a project by enabling suppliers and contractors to deliver products and services which are fit for purpose and lower in cost, while meeting safety, environmental and quality goals.

Essential Activities

- Define required standards during project definition
- Adopt recognised standards and materials (international, national or industry etc.)
- Specify functionality with clarity and precision
- Define the boundary parameters
- Define selection criteria and critical success factors
- Pursue cost effective solutions
- Avoid compounding contingencies and factors of safety
- Involve vendors in concept development
- Maximise use of vendors' standard designs
- Debate and accept innovative ideas

The Essential Activities are discussed in more detail in the following Guidelines for Implementation.

Guidelines for Implementation

Guidelines for the selection and use of standards and specifications are as follows:

7.4.1 Guidelines for Defining Standards during Project Definition

The standards adopted on a project can have a major impact on the resulting cost and performance of the plant. The setting of standards is a key activity during project definition, the standards adopted being determined by the overall objectives for the project. Factors which will have a bearing on the standards adopted include:

- Safety requirements
- Containment policy
- Responsible care, employee and community relations policies
- Environmental considerations
- Statutory or insurance requirements
- Nature of the process technology and materials employed on the plant
- Existing site standards
- Plant maintenance philosophy
- Plant design life
- Control and operating philosophy
- Plant availability and reliability requirements
- Spares and stores policy
- Integration with existing plant or equipment

It is important that the basic standards for the project are agreed early in project definition with the project owner. Where possible, the cost and risk implications of adopting alternative standards should be quantified before decisions are made. The project manager should then agree timings for the production/adoption of more detailed standards and specifications for use through the life cycle of the project. However, the key design, construction and operational standards should be agreed and in place before project execution commences. It is strongly recommended that standards, once agreed, should remain fixed for the duration of the project.

7.4.2 Guidelines for Adopting Recognised Standards and Materials Specifications

Where possible recognised standards and materials specifications should be adopted for the project. These may be international or national standards, or may be industry-specific.

Relevant standards should be identified and assessed for suitability. Existing standards and specifications should be reviewed on a regular basis to ensure they are up to date and relevant.

7.4.3 Guidelines for Specifying Functionality

The functionality of products and services should be specified with clarity and precision based upon the specification of user requirements. The objective should be to specify output requirements by adopting a high level 'black box' type of specification where possible. It is important, however, that the user requirements make clear and distinguish between those features which are mandatory and those which are desirable. It is usually impractical to prepare all such specifications on a project-by-project basis and organisations should seek to build a library of functional standards and specifications, or to adopt generic, industry wide standards which have been developed by other organisations and which may be used as models(e.g. ISO Standard Guidelines, CRINE Network and NORSOK).

To ensure functional standards and specifications are widely used, it is recommended that standards are indexed and structured in a logical format and readily accessed by users through a document management system.

It is important to ensure that any functional specification is developed by a process which involves a representative cross section of specialists from within the particular industry or market sector relating to the potential application of the product in question. Ideally this cross section should include vendors (more than one but probably no more than three), designers, engineering and construction contractors, fabricators, operators and maintenance staff. The objective for this task group is to develop a generic specification for a service, type of equipment or bulk material which addresses technical objectives and responsibilities, safety requirements and functional requirements.

The functional specification so developed should have appended to it evaluation criteria, template data sheets, and an operating and maintenance philosophy. It is important that the scope proposed for a functional specification is not too broad. A product that requires substantial supplementary documentation, or which is seen as too imprecise by users, is likely to reduce rather than enhance project performance.

The process of developing a generic functional specification will typically span several months but should not take more than four or five task group meetings to achieve the objectives. When developing functional specifications bear in mind that the '100% solution' should not be pursued. This is not only unrealistic and probably unachievable, but each project also has a slightly different emphasis on selection criteria, requiring some tailoring of the generic standard.

Functional specifications should adopt the recommendations of the ISO standard on format and structure. Any pilot testing of functional specifications should be made over a reasonable period (preferably a complete project 'cycle') to ensure that the benefits are fully evaluated.

7.4.4 Guidelines for Defining Boundary Parameters

It is essential to state the limiting boundary parameters and integrating requirements of the systems or operating environment in which the goods or services will perform. These parameters can relate to physical compatibility or may describe operational interaction.

7.4.5 Guidelines for Defining Selection Criteria

Selection criteria and/or critical success factors must be stated to help vendors understand the functional requirements of the goods or services to be supplied, and the relative importance of the various requirements to the buyer. It is helpful for client buyers to share with potential vendors the critical success factors to be used as selection criteria, and the measures which will be used to assess performance.

7.4.6 Guidelines for Pursuing Cost Effective Solutions

Pursuing cost effective solutions requires that total acquisition cost be assessed rather than just initial purchase price. Vendors should be given the opportunity and incentive to reduce costs by permitting flexibility in the way they supply products and services. Over-specification should be avoided - insistence on standards which increase cost without adding value will not bring benefits to the project.

7.4.7 Guidelines for Avoiding Compounding of Contingencies

Contingency allowances and factors of safety are often unnecessarily compounded in their effect through over design, or by the application of safety factors to individual components and again to the final product. Conservatism in sizing or specification of duty can add significant cost.

7.4.8 Guidelines for Involving Vendors in Concept Development

Involving vendors in at an early stage of design development is advisable to avoid unnecessary costs. Vendors often have expertise in their own field which is not available within the buyer's organisation and can sometimes suggest solutions which simplify scope or avoid problems. However, at this stage much of the work must be done before a firm specification has been defined, hence the issue of maintaining commerciality must be addressed to protect the interests of both buyer and vendor.

7.4.9 Guidelines for Maximising Use of Vendors' Standard Designs

A product or service which meets a buyer's requirements and which is based on a vendor's standard design will frequently deliver a more cost effective solution than a design developed as a 'one off' response to a specific and prescriptive specification. Key reasons for this include:

- Lower capital costs
- Reduced product lead times
- Reduced design costs
- Earlier availability of drawings and documentation
- Improved definition of product
- Reduced documentation
- Improved quality of product or service
- Reduced response times
- Reduced costs of development and commercial support
- Increased standardisation within the user organisation
- Improved component and spares interchangeability
- Reduced spares inventory
- Improved availability and reliability
- Greater assurance of fitness for purpose from proven track record

While use of vendor standard designs will often bring benefits, it is recognised that there are situations which demand non-standard or customised designs to meet the specific requirements of a project. This might be because vendor standard designs fail to meet all aspects of the duty demanded, for example, reliability, safety, integration with existing equipment or novel materials of construction. It is also recognised that there is a commercial balance to be struck since standardisation can sometimes result in over-design by ‘specifying up’ to the next standard size. However, the industry has a history of over-customising design and buyers should routinely challenge the need for specially designed equipment and test whether vendor standard designs could be used instead.

7.4.10 Guidelines for Accepting Innovative Ideas

Much can be gained by encouraging an innovative approach by involving vendors which can often offer alternative solutions and other options. Buyers should encourage debate and constructive criticism from vendors, and vendors should not be afraid to challenge buyers’ assumptions within an open and positive environment. Vendors also need to check their standardised designs frequently against changing industry requirements and the development of new technology to ensure their products better match project needs.

Workbook Cross References

VEP 1.2	Project Definition and Objectives
VEP 3.1	Procurement Cycle Management
VEP 6.2	Innovation and Intellectual Property
VEP 7.2	Design Effectiveness
VEP 7.3	Constructability

Further Reading

ISO Standard Guidelines on the Preparation of Functional Specifications

CRINE Network Booklet. Functional Specifications: Guidance notes for effective use in procurement of equipment, materials etc.

Refer to Section 5 for CRINE Network contact details.

ACTIVE Workgroup

ACTIVE VEP 7.4 originated with the Procurement Workgroup. Refer to Section 5 for contact details.

Attachments

None.

ACTIVE VALUE ENHANCING PRACTICE

No. 7.5 PROJECT HANDOVER AND COMMISSIONING

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ACTIVE VALUE ENHANCING PRACTICE

No. 7.5 PROJECT HANDOVER AND COMMISSIONING

Purpose and Benefit

ACTIVE VEP 7.5 addresses the need for clearly defining the scope of project commissioning activities, and emphasises the clarity which is vital for a smooth, timely and successful project delivery.

To achieve a seamless handover from the project team to the operating team it is vital that handover is considered at the conception of the project. If this is done, the potential for extended schedules and commissioning changes at the end of the project will be reduced and project costs contained, resulting in increased customer satisfaction.

Essential Activities

Most projects consist of a number of phases, culminating in the delivery of a completed project which requires a handover process to the commissioning or operations team for start-up and ongoing operation of the plant or facility.

Problems which often arise at this stage of the project may be significantly reduced by:

- Clearly defining the objectives of commissioning and handover
- Clearly defining project deliverables

Guidelines for Implementation

7.5.1 Guidelines during project definition phase

It is essential during the definition phase of the project that there is a clear understanding of the operating team's functional requirements, in order to identify the project delivery package. A sound understanding of these requirements will ensure that all parties are working towards the same objectives, thereby achieving the most efficient application of resources. It will also ensure the smooth transfer of the project into the operations phase and the satisfactory completion of the project.

As part of the process of determining the project delivery package, requirements should be defined at this time which would normally include:

- Health and safety plan
- Quality plan
- Location and nature of utilities and services
- Design criteria (specifications, standards etc.)
- General details of construction methods and materials used, inclusive of any known hazards or hazardous materials
- Operating Information (inclusive of constraints)
- Emergency and fire fighting system requirements
- Maintenance information
- Parts listings
- Commissioning information including test certification
- Approvals as required
- As built drawings
- Details of any licensing agreements

The documentation produced for the majority of the above items will form the Health and Safety File as required by Construction (Design and Management) Regulations 1994, and should be clearly identified as such to enable the final handover package to be developed progressively as the project proceeds.

7.5.2 Guidelines during project execution phase

From the start of the project, handover and commissioning should be considered as part of the project programme. This will provide everyone involved with adequate time to plan resources and prevent delay, thereby avoiding potentially negative cost and schedule consequences. It is important at this stage to develop links with the team who will be responsible for the operation and maintenance of the plant to ensure the overall process moves smoothly through the handover stage.

The operating team should be encouraged to interface with the project team on a regular basis to prevent misunderstandings occurring. This will also involve the development of a tightly managed change control process.

The project team should provide the operating team with regular updates to issued information. It may also be appropriate during this period for the project manager to arrange regular meetings with the commissioning or operating team to raise awareness and clarify expectations. This process will help develop close working relationships during the actual handover and ensure potential problems are identified prior to the handover phase of the project, which otherwise may prove problematic to both parties and costly in financial terms. As mechanical completion of the plant approaches and as more detailed information becomes available, the project team should provide the commissioning team with an information pack comprising:

- System functional specification
- Details of interface with existing equipment
- Detailed schematics
- Detailed commissioning and handover programme

As handover approaches, a series of joint site visits should be arranged to focus on outstanding actions and to resolve any remaining problems.

Commissioning inspections and tests must clearly demonstrate that the equipment is ready for start-up in compliance with the inspection and test specification or plan, including third party approvals where appropriate.

At all times due recognition must be given to quality and safety factors and any supplementary risk assessment findings. Neglect of these issues could create a situation which could prove costly both in financial and human terms.

7.5.3 Guidelines for phased handover stage

It is often not possible to start up a completed plant in one operation, requiring a phased start-up approach to be adopted. In this situation, the plant should be divided into commissioning systems on an agreed basis between the project manager and commissioning or operations manager. When substantially complete, a qualified handover certificate should be raised for each system.

7.5.4 Guidelines for qualified handover

As part of the handover process the project team must ensure that the operating team has all the necessary documentation and information to ensure the safe and efficient operation and maintenance the plant. This also ensures clarity requirements and avoids potential misunderstandings and conflict. At this stage that the commissioning or operating team should formally take responsibility for the operation and maintenance of the asset.

The handover information may at this stage not be in final form but would normally consist of the following:

- Training documentation
- Operating and maintenance manuals
- Fault finding guides
- Spare parts lists
- Special tools and instrument lists
- Equipment data sheets
- Certifications and approvals
- Warranty documentation
- Reliability documentation
- Outline of the Health and Safety File

A list of documents transmitted to the operating team for the asset should be attached to the qualified handover certificate and should include:

- Asset registration information
- Documentation listing
- Joint visit report (concerns/problems listing)

During the period between a qualified certificate being accepted and a final handover certificate being issued, the project will should ensure snags are cleared, address any outstanding concerns, and complete delivery of all documentation.

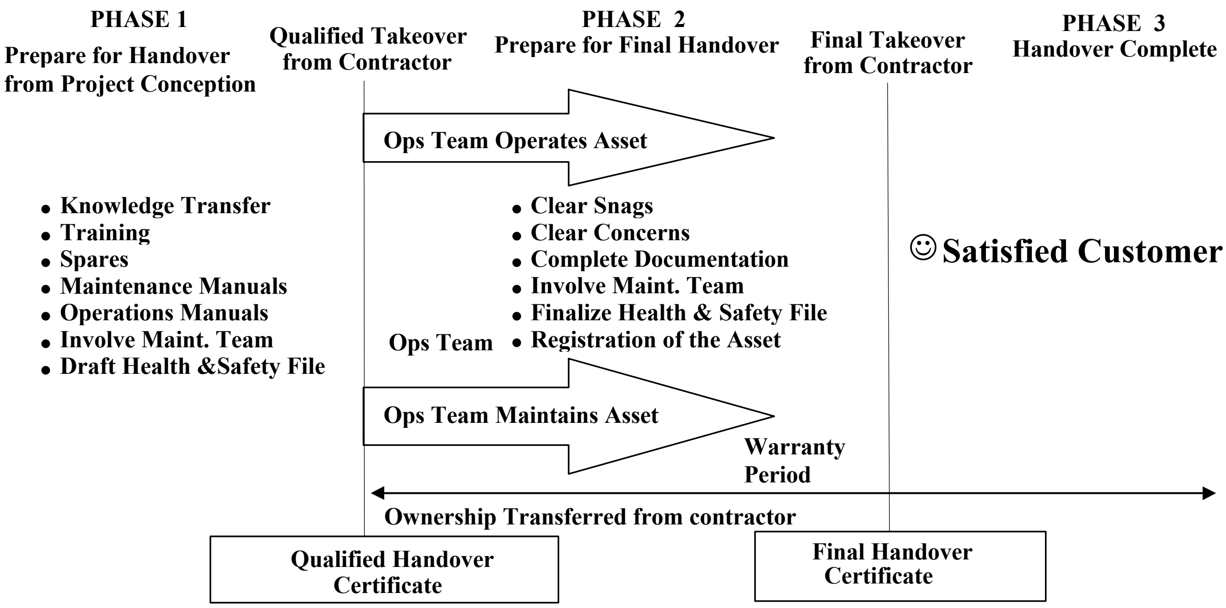
7.5.5 Guidelines for final handover

Once all outstanding snags have been cleared and final documentation completed, a final handover certificate should be raised with the following attachments:

- A full listing of documentation issued
- The finalised Health and Safety File index
- Design defects liability information
- Definition of software rights, as appropriate
- The qualifications listing recording the clearance of all snags and concerns

7.5.6 Guidelines for handover and commissioning process

The process of handover and commissioning is summarised diagrammatically in the following figure.



Workbook Cross References

VEP 1.2	Project Definition and Objectives
VEP 1.3	Project Planning
VEP 3.1	Procurement Cycle Management
VEP 4.1	Information Management
VEP 7.1	Project Control
VEP 7.3	Constructability

Further Reading

None.

Attachments

None.

ACTIVE Workgroup

ACTIVE VEP 7.5 originated with the Project Execution Workgroup. Refer to Section 5 for contact details.

ACTIVE PRINCIPLE 8

EFFECTIVE PERFORMANCE MEASUREMENT

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ACTIVE PRINCIPLE 8

EFFECTIVE PERFORMANCE MEASUREMENT

Measurement is crucial for improving project performance and it is important that measures are established for the various stages of the project process. The starting point for measurement must be the objectives and critical success factors for the project. From this starting point, measures should be defined which will relate activity and progress to the achievement of these goals. Bearing in mind that ‘what you measure is what you will get’, measures must be defined with care, as the choice of inappropriate or sub-optimal measures may drive the project in the wrong direction.

Definition of measures is often not a simple task. ‘Hard’ measures, which can be determined by collecting statistical data and using objective measurement are usually the easiest to obtain but are often less useful indicators of performance than ‘soft’ measures which measure more subjective aspects such as behaviours, relationships and capability. The skill is to find hard measures which are good indicators of the softer issues which drive project performance.

For capital projects, there are two types of measures which need to be defined: output measures which measure whether project objectives have been achieved, and indicator measures which measure factors which will strongly influence whether the required outputs are likely to be achieved. Typical examples of output measures include:

- Achieved cost
- Safety performance
- Completion date
- Product quality
- Plant flowrate

Typical examples of indicator measures include:

- Quality of definition
- Project organisation and project process
- Supply chain effectiveness
- Design productivity
- Use of value enhancing practices
- Control of changes
- Progress against schedule

Although output measures are the ultimate yardstick of project performance, they are often not available until late in the project when remedial action may be too late. Indicator measures, however, can be used as the project progresses as predictors of likely outcomes at each of the stage gates in the project process. Indicator measures, therefore, represent a powerful project management tool which can be used for controlling the project and for assuring the project owner on the likely achievement of the project goals.

The use of effective measures on projects and the collection of common, consistent data open the way for benchmarking performance. Benchmarking is a comparative process which uses previously achieved measures of outstanding performance to set challenging standards for improvement on subsequent projects.

The process is based upon measuring current project performance and comparing results with known benchmarks or standards which represent the best in that particular field. It is well established as a powerful technique for driving improvement, based upon measured results rather than intuition or perception.

Since performance benchmarking is concerned with competitiveness, it is usual within the industry for benchmarking to be carried out by a neutral third party organisation operating under confidentiality agreements with participants to preserve anonymity and avoid potential breaches of competition law. Benchmarking can be undertaken at different levels to drive performance improvement in specific areas.

Key areas for benchmarking on capital projects are:

- Project Performance
- Supply Chain Performance
- Design Effectiveness

Supporting Value Enhancing Practices:

VEP 8.1 Performance Benchmarking
VEP 8.2 Contract Monitoring and Measurement

ACTIVE VALUE ENHANCING PRACTICE

No. 8.1 PERFORMANCE BENCHMARKING

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ACTIVE VALUE ENHANCING PRACTICE

No. 8.1 PERFORMANCE BENCHMARKING

Purpose and Benefit

Benchmarking is a technique used by organisations and project teams to compare their performance with a recognised achievement level which is considered to be the best yet attained in a particular business sector. The purpose of making such comparisons is to drive improvement in performance to equal or surpass that of the best.

ACTIVE VEP 8.1 will assist with the application of benchmarking to construction projects. In addition to setting and enhancing performance standards, benchmarking is also able to stimulate improvement in project team performance and encourage innovation and creativity.

Essential Activities

The essence of benchmarking is to first identify the activities and processes employed by the project or organisation, followed by gathering achieved performance data from measurement and comparing these with the benchmark model, and then to apply effort to improve their performance. Benchmarking consists of the following essential activities:

- Select and analyse processes for benchmarking.
- Identify key indicator and output measures which form the basis of a benchmark model.
- Compare measured results to benchmark performance.
- Interpret results and draw up an action plan for improvement.

The Essential Activities are discussed in the following Guidelines for Implementation. Typical benchmarking criteria are included in Attachment 8.1-A.

Guidelines for Implementation

8.1.1 Guidelines for Selecting and Analysing Processes

Benchmarking can be carried out on a wide variety of business and project processes and can be invaluable in highlighting performance deficiencies plus the actions needed for improvement. Within engineering capital projects, benchmarking can be applied at different levels to check whether the various elements of the project process are effective. For example, benchmarking can be used to determine whether the achieved performance of the project in terms of cost, schedule, safety performance, operability etc. matches the best achieved elsewhere. In addition, benchmarking can also be applied to specific activities such as design effectiveness, supply chain relationships etc. In order to make benchmarking effective the most important competitive factors in a business or project operation should be selected as candidates for benchmarking.

Since benchmarking is a competitive activity, it is often easier to have the benchmarking exercise 'brokered' by a neutral third party who will work with the project teams of different companies to derive the data necessary for comparison, usually under a confidentiality agreement. The aggregated data are then shared and each company or project can assess where the performance of their project lies in the performance spectrum. If data on sufficient projects from each company are available, it becomes possible to compare overall company project performance.

Benchmarking organisations working with projects in the process and energy sectors include:

- European Construction Institute (ECI) working with the CII Benchmarking model
- Independent Project Analysis Inc. (IPA)
- First Point Assessment Ltd (FPAL)

See Section 5 for contact details.

The process of benchmarking is based on the measurement of key factors on a common like-for-like basis for the sample being compared. To provide feedback on improvement areas, it is usual to identify indicator measures as well as the required outputs. Indicators are factors which are known to be reliable indicators of whether the output measures are likely to be achieved. There is usually an historical or statistical link between indicators and outputs. For example, there is a strong statistical correlation between the indicator measure of the quality of project definition with the resulting project output.

Having identified the key measures which are indicators of performance within the process it is then necessary to establish the means of gathering data based on those measures.

8.1.2 Guidelines for Identifying the Model to Act as Benchmark

A benchmarking team should be established with the team leader accepting 'ownership' of the benchmarking process within each company or project. The corporate management of each company involved should also actively and visibly support the process. It is important that the process is undertaken openly and honestly. To ‘massage’ data or selectively ignore inconvenient results serves merely to engage in corporate self-delusion which will lead to complacency and a failure to improve.

If the project is using a benchmarking company to undertake the exercise, the benchmarking model and method will be defined by that company, which will facilitate the process of compiling the data. It is important that key participants understand the basis of the metrics and measures used in order to avoid the possibility of not comparing like with like.

For areas where a benchmarking model does not exist, it is possible to develop a model which can provide a valid basis for performance comparisons. This can be appropriate for internal or in-house benchmarking within larger, multi-business companies. When seeking other benchmarking partners, the search should include other projects and companies within the same corporation, competitors, and the best companies in other industries.

Collaboration with the benchmark model is essential. Many companies and projects are willing to act as partners in benchmarking provided there is a resulting benefit, and provided that confidentiality is strictly observed. The benefit for the benchmarked company will be feedback about the findings and how the benchmarked company itself can improve. It is important to ensure that the requirements of competition law and the protection of confidentiality are carefully observed.

8.1.3 Guidelines for Comparing Performance

Where benchmarking organisations are used, the results will be presented in a standard format. Where this is not so, the benchmarking team should examine the practices, processes and performance of the model for direct comparison with its own performance in the selected areas. Detailed lists of questions prepared in advance of visits will assist with this. The results will invariably reveal differences between the company's performance and best practices in the model, identifying areas which need further detailed investigation to establish the reasons for underperformance.

8.1.4 Guidelines for Implementing an Action Plan

The differences in performance should be made public within the benchmarking organisation to obtain a momentum for change. The team should develop an action plan to implement new processes, incorporating the best practices discovered within the model. Corporate support within those companies involved in the exercise is vital for this to be achieved effectively.

Where a benchmarking organisation is not being used, the findings, changes initiated and improvements obtained should be communicated to the benchmarking partners. This ensures that the learning process is a shared experience. Upon completion of the benchmarking programme the result should be compared once again with the model organisation, and if necessary the process should be further enhanced and repeated.

Workbook Cross References

VEP 1.1	Project Process
VEP 1.2	Project Definition and Objectives
VEP 6.1	Continuous Improvement
VEP 7.1	Project Control
VEP 8.2	Contract Monitoring and Measurement

Further Reading

ECI TF006/3. Total Quality in Construction: Measurement Matrix and Guide.
ISBN 1873844174.

CII BMM 96-2. Benchmarking and Metrics Report 1996
(ECI/CII Benchmarking Initiative).

CII BMM 96-1. Benchmarking and Metrics Summary 1996
(ECI/CII Benchmarking Initiative).

For CII contact details refer to Section 5.

Also refer to:

Independent Project Analysis Inc. (IPA)
First Point Assessment Ltd (FPAL)

For contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 8.1 originated with the Measurement Workgroup. Refer to Section 5 for contact details.

Attachments

8.1-A Typical Benchmarking Criteria

ACTIVE VALUE ENHANCING PRACTICE

No. 8.1 PROJECT PROCESS

ATTACHMENT 8.1-A

TYPICAL BENCHMARKING CRITERIA

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ATTACHMENT 8.1-A

TYPICAL BENCHMARKING CRITERIA

- Meeting key dates; budget cost targets; design freeze dates; programme for issuing reports.
- Meeting ‘fit for purpose’ and ‘value for money’ targets.
- No modifications; variations to workscope quantities; number of stages in the change order process.
- Project cost per unit of output generated; project timescale per unit build.
- Manhours per tonne; weld repair rate.
- Plant performance targets; cost of plant v performance; cost of maintenance per year; cost of spares per year.
- Overall target operational costs per year of asset life; overall target maintenance costs per year of asset life.
- No commercial disputes; payment on time within ? days of receiving correct invoice; no variations; common goals.
- Cost per order placed; cost per invoice paid; percentage of correct first time invoices.
- Number of training days per year per employee; percentage of employees within safety targets; no insurance injury claims.
- Risk management training to percentage of employees; effective lines of responsibility and authority.
- Target percentage of project final records archived electronically.

ACTIVE VALUE ENHANCING PRACTICE

No. 8.2 PROCUREMENT PERFORMANCE MEASUREMENT

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ACTIVE VALUE ENHANCING PRACTICE

No. 8.2 PROCUREMENT PERFORMANCE MEASUREMENT

Purpose and Benefit

The procurement cycle for a project encompasses the activities of establishing a procurement strategy, prequalifying and selecting contractors and suppliers, and expediting and managing the delivery of the goods and services under the commercial arrangements agreed. ACTIVE VEP 8.2 provides guidance on how the performance of the procurement process can be effectively measured and benchmarked to ensure that the project objectives are better achieved.

Essential Activities

The Essential Activities for measuring and monitoring the performance of the procurement cycle on capital projects are as follows:

- Determine procurement goals from the project objectives.
- Identify and define procurement cycle activities and develop a flowchart.
- For each area of activity, determine the performance indicators and from these derive Key Performance Indicators (KPIs) which relate to the achievement of the procurement goals.
- Monitor performance against KPIs.
- Benchmark KPI performance against internal or external comparative performance data.

The Essential Activities are discussed in more detail in the following Guidelines for Implementation.

Guidelines for Implementation

In order to measure and monitor the effectiveness and performance of the procurement cycle, it is necessary to identify and define the various individual processes or activities that comprise the procurement cycle. These will be different for each company and its position in the market place, and for the nature of the project being undertaken.

For example, an operating company might define its procurement cycle as the process from conceptual design to the start-up and operation of the plant. A supplier might define its procurement cycle as the purchase of constituent materials for the equipment it is to supply.

8.2.1 Guidelines for Identifying Procurement Goals

It is necessary to define the internal goals of the procurement process in the context of the project objectives, and then identify methods for measuring and monitoring the success in achieving these goals. The following are examples of the many internal goals that are typical for a procurement process (note that this list is not exhaustive):

- Purchase of goods or services in an efficient and cost effective manner
- Best value purchasing
- Minimum overall cycle time
- Minimum life cycle cost including, maintenance, reliability, operating costs, technical performance, safety and environmental impact
- Quality product and/or services to required specifications with minimum or no customer intervention
- To reduce the cost of the procurement process
- To reduce the whole-life or lifetime cost of goods, materials or services
- To reduce the procurement cycle time
- Provision of supplier information to match the overall project programme
- Delivery on time or earlier
- No surprises and good change control
- Safe product and/or installation
- No damage to the environment
- No claims
- Good after sales support
- Innovative solutions from suppliers

In many cases buyers define the only goal as lowest cost but often this does not actually result in best value for the project. Simply defining lowest cost as the goal gives little indication of how the performance and effectiveness of the purchased goods or services are to be judged.

Consideration of the above goals will enable the procurement manager to focus on those areas which should be measured, and to initiate appropriate monitoring.

Since the ultimate purpose is to meet the project objectives, procurement goals must be consistent with and contribute toward the project objectives.

8.2.2 Guidelines for Developing a Flowchart of Procurement Cycle Activities

In order to establish measure against which procurement cycle performance can be assessed, it is necessary to understand the activities which take place. These should be activities which actually happens rather than those which the company procedures say should happen.

As a first step, it is helpful to develop a flowsheet of the procurement process within the project to ensure that all activities are identified and to understand how they interrelate. If activities are identified which do not contribute either to the procurement goals or project objectives, the needs for such activities should be seriously questioned. Similarly, key activities to achieve goals or objectives may be missing or inadequate.

As an example, activities which might be identified as part of the procurement cycle could be:

- Prepare a list of suitable suppliers
- Evaluate the bids
- Expedite
- Review supplier drawings

8.2.3 Guidelines for Defining Performance Indicators

Most activities encompass several actions; the time taken to carry out these actions can be measured. Similarly the effort expended (or manhours) can be measured and performance indicators generated for different activities. These will be different for the goods or service being considered. Examples of performance indicators include the average time to produce a list of suppliers or the average cost of producing such a list. Monitoring at this level will enable the performance of each activity to be improved, thereby improving efficiency and reducing internal costs.

At a higher level, Key Performance Indicators (KPIs) should be identified which consolidate all the various performance indicators into a few key measurements. These KPIs should be tested against the project goals and objectives to ensure they are the right indicators for the activities being measured. For example, KPIs might include measuring the average overall cycle time for an order or the average cost of placing an order.

Other ways of enhancing performance and improving efficiency include reviewing the actual procurement process against the ACTIVE VEPs and add steps to incorporate the principles that are not currently covered by the procurement cycle. As an example, the procurement cycle might not include the development and production of a procurement strategy for the project. The intention should be that the procurement cycle cover all the appropriate ACTIVE principles and practices.

8.2.4 Guidelines for Monitoring using Key Performance Indicators

Measurement and monitoring should cover both internal measures and assessment of performance against external benchmarks. The need for external benchmarks might also influence the choice of KPIs so that valid comparison of data can be made.

Examples of Key Performance Indicators are:

- Capital Growth
- Quality
- Time to place an order
- Cost of placing an order
- Customer complaints
- Project duration
- Turnaround time of drawings/information
- Cost of inspection/expediting
- Cash-flow
- Payment
- Cost of procurement
- Delivery times from placement of order

Examples of performance indicators for specific areas of procurement activity include:

- % increase in capital costs of projects
- % increase in order value per £1K of orders
- Number of non-conformances per audit
- Number of concessions per order/project
- % rework
- % increase in operating costs
- % increase in maintenance costs
- Time from receipt of requisition to placement of £1K of orders
- Cost of procurement as % of value of orders placed
- Hours to place £1K of orders
- Number of complaints per project/order
- Number of weeks per £1m of orders
- Number of weeks per project
- Number of days to review and return drawings/information
- % deviation from project curve
- % payments to suppliers overdue
- % of overall project cost
- Average weeks (from placement of order to delivery) per order

In general the information used to generate the KPIs should be readily available without significant resources being expended in gathering or generating the information.

8.2.5 Guidelines for Benchmarking Procurement Performance

In addition to internal measures, data should be gathered from customers and suppliers on how they perceive the procurement cycle. The external benchmarking undertaken by First Point Assessment of performance feedback of both buyers and sellers is highly recommended. (See Further Reading at the end of this Section).

Customer feedback should be sought in the following areas:

- Organisation
- Facilities
- Commercial management
- Product quality
- Product performance in service
- Service quality
- Project management

- Planning and delivery
- Supplier management
- Installation and commissioning
- Health and safety
- Environment
- Competency and training
- Improvement
- Customer interfaces

In the First Point Assessment process, scores between 1 and 10 are given by the customer for each relevant area against defined criteria. Each score is discussed and agreed between the parties. Feedback is given to First Point Assessment on a confidential basis, the data then being used to benchmark results against industry norms.

Workbook Cross References

VEP 1.7.5	Measuring the Value of the Procurement Process
VEP 3.1.11	Guidelines for Contract Monitoring and Measurement
VEP 8.1	Performance Benchmarking

Further Reading

"Benchmarking the Supply Chain" (CBI/DTI/Cabinet Office Booklet)

Also refer to First Point Assessment Ltd. For First Point Assessment contact details refer to Section 5.

ACTIVE Workgroup

ACTIVE VEP 8.2originated with the Procurement Workgroup. Refer to Section 5 for contact details.

Attachments

None.

SECTION 4

IMPLEMENTATION

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SECTION 4

IMPLEMENTATION

4.1 Introduction

This Workbook contains a set of eight ACTIVE Principles underpinned by a series of Value Enhancing Practices (VEPs). By applying these effectively to the delivery of capital projects in the process and energy industries, the objectives of improving cost performance and competitiveness for all companies in the supply chain will be met. ACTIVE is seeking to demonstrate that the Principles and VEPs will actually deliver the benefits claimed for projects, with the aim of encouraging changes in working practices throughout the whole industry and providing feedback for further improvement. This section describes how the ACTIVE Principles and VEPs can be applied in practice to achieve that improvement in project performance.

Although ACTIVE Principles and VEPs can be applied to any size or type of capital project and may be implemented at any point in the project, maximum benefit will be gained by adopting ACTIVE Principles at the conceptual project phase since it is at this stage that the greatest scope for value improvement exists. The benefits to the project of applying ACTIVE will be dependent on the project objectives and may result in shorter timescales, lower capital costs or enhanced plant performance, depending on project imperatives. It is also recognised that current practice in companies across the industry will be at different points on the ACTIVE learning curve, hence the potential for improvement will vary from project to project.

4.2 Implementation Process

For projects which intend to apply ACTIVE Principles and VEPs, the implementation process should begin by agreeing the following:

- Objectives and key success criteria for the project by adopting the ACTIVE Principles and practices
- Extent to which the project expects to apply the ACTIVE Principles and practices
- Timing of reviews
- Method for benefiting from feedback of lessons learned

4.3 Use of the ACTIVE Workbook

The ACTIVE Workbook provides clear, concise information on how the effectiveness of projects can be enhanced. The guidance is available to business decision makers, project managers and contract managers who need help with establishing a sound basis for the project, as well as to practitioners at the working level who can obtain detailed guidance on specific issues.

ACTIVE also has available case study material which can be used to support the Workbook. Through links to other similar initiatives in other industry sectors, there is also access to a wide range of documentation, while ACTIVE's academic links provide access to recent research material on project management topics.

4.4 Training

ACTIVE has already established links with a number of training establishments and courses have been developed to raise competence and awareness in:

- Project team building and supply chain relationship building
- Awareness and application of ACTIVE principles

Courses have been held with Cranfield University and also through EPICC (European Process Industry Competitiveness Centre), and work is continuing within the ACTIVE initiative to make further educational material available to support projects. Financial support for some attendees of these courses is available through ECITB (Engineering Construction Industry Training Board) and EMTA (Engineering and Marine Training Authority). Contact details are included in Section 5.

4.5 Network Help

ACTIVE has established Inter-ACTIVE, the ACTIVE Value Enhancement Network, to provide advice, support and help in applying ACTIVE Principles and practices to specific areas of project delivery. The network is based on members of ACTIVE working groups covering:

- People and Behaviour
- Information Management
- Effective Project Execution
- Procurement
- Measurement

In addition, there are networks accessible through ACTIVE's Engineering Suppliers and Contractors Group (ESCG) and, more recently, the Grangemouth forum for site based projects established with BP and Foster Wheeler. ACTIVE is publishing a directory of contacts in the network to provide easy access to sources of knowledge and experience on the application of ACTIVE Principles and practices.

Advice and help will be given in good faith but responsibility for decision making, and the consequences of those decisions, remains with the project team. The ACTIVE Secretariat will provide a focus for enquiries from projects for help on specific issues, directing queries to those in the network most able to help.

4.6 Measurement and Benchmarking

Measurement of project performance is an important component of the ACTIVE process. ACTIVE has made arrangements with two benchmarking organisations which enable projects to obtain direct measures and comparisons of their performance in confidence. The two benchmarking approaches are:

- **Project Performance Benchmarking**

  Project performance benchmarking has been introduced by the European Construction Institute (ECI) using the methodology developed by the Construction Industry Institute (CII) in the USA. The database now has data on approximately 400 projects to provide a basis for performance comparison. Participation in the benchmarking programme, which reviews eight key value enhancing practices closely aligned with the ACTIVE principles, is recommended by ACTIVE and is available through the ECI.

- **Supply Chain Benchmarking**

  Supply chain benchmarking has been developed by First Point Assessment Ltd (FPAL), a benchmarking organisation developed as part of the offshore oil and gas industry's CRINE initiative to measure the effectiveness of relationships between owners, contractors and suppliers. Performance assessments are made and agreed, both of the purchaser's performance and the supplier's performance, against 15 key elements. The database built up by FPAL enables benchmarking of performance to be performed and provides useful feedback as a driver for improvement. FPAL is now able to extend the application of its assessment and benchmarking capability to the onshore process and energy sectors as part of the ACTIVE Initiative.

All benchmarking described above is completed under confidentiality agreements with the organisations concerned. Details of contacts with these and other benchmarking organisations are given in Section 5.

4.7 Assessment and Review

A set of Assessment Check Lists for use at defined stages of the project process is provided in at the end of Section 4. Use of these check lists will allow teams periodically to review the extent to which ACTIVE Principles are being implemented on each project. The timing of these reviews can be varied to suit each project, but the suggested timings for reviews are as follows:

- **Review 1:**

  Project objectives agreed but project scope and implementation strategy still being defined

- **Review 2:**

  Project authorisation/sanction stage

- **Review 3:**

  Detailed design complete and construction work starting

- **Review 4:**

  Plant physically complete but awaiting start-up

- **Review 5:**

  Project complete

This final review is important and should be undertaken once the project has been completed but before the project team disperses. It is particularly important to review the learning from the project.

It should be noted that the check lists to be used in these reviews are not intended to be exhaustive and are designed as a broad check on the application of the ACTIVE Principles and practices at the appropriate stage of the project. The check lists are not intended as a detailed audit of the project and their use should not require a great deal of preparatory work.

It is recommended that the check lists in the Workbook should be photocopied for each project to enable a record to be kept as the project progresses.

Each assessment consists of a series of questions with tick boxes numbered one to five. A sixth box is also available if the question is not applicable to the project under review. A score of five is ticked if the question can be answered as fully completed or complied with. A score of one is ticked if nothing has been done at all. Scores in between reflect partial completion or compliance. Against each question there is a reference to the appropriate VEP which can be consulted if more detail is needed to understand the question.

Aggregation of scores at the end of the review is not necessarily meaningful since the relative importance of questions varies. However, it is important that the project team agrees the action to be taken in areas where the score is low. At the next review stage it is suggested that the completion of actions from previous reviews are checked before starting the review.

4.8 Project Cost Savings

To provide feedback on the benefit of the application of the ACTIVE Principles and VEPs, companies are asked to complete the attached ACTIVE Project Cost Savings proforma and return it to the ACTIVE Secretariat. This will assist with the continuing review of the Workbook to ensure that the Principles and VEPs remain 'best', and will help to demonstrate that the ACTIVE initiative has met its overall objectives. Although, in the interests of commercial confidentiality, companies may wish to retain learning internally within their own organisations, it is hoped that much of the generic learning can be shared to demonstrate the improvements made possible by applying effective behaviours and practices.

With reference to the Project Cost Savings proforma, the cost outlook chosen is that in existence after the initial project planning has taken place and the scope is well determined. This is expressed as the pre-process design cost outlook. To avoid proprietary issues, savings are to be specified as a percentage of project costs.

Savings are to be recorded against major, well recognised cost categories. Examples of specific costs falling into each major cost category are given below. This is not intended to be totally comprehensive list but a guideline to aid consistency of data collection for the template. It is helpful to split savings, where possible, between those achieved pre-sanction, for example by value engineering during process design, and those achieved post sanction.

Finally, to establish which ACTIVE Principles are most effective, the project management team should judge how savings can be attributed to each Principle on an 80/20 basis. It is accepted that this will be judgmental and not an exact science

Examples of specific costs in each major cost category on the proforma

Pre-sanction costs

Scoping studies
Economics development
Design basis definition
Pre-design engineering studies
Process design development
Cost estimating, schedule development
Execution strategy development
Constructability studies
Initial HAZOP studies
Pre-sanction P&ID development

Owner s costs

Owner’s project management team (PMT)
Planning approval development
Site investigation, land acquisition
Third party contracts, consultancies, insurance premiums
Establishment of PMT, accommodation
Licence royalties (pre-opex)
First fill of catalyst an chemicals
Third party Inspection
Owner’s commissioning costs
Setting up project standards
Development of co-ordination procedure
Owner’s discipline engineers
Project control staff

Engineering

Contractors’ discipline engineers
Computer costs
Procurement and expediting team
Site based design team
Home office design team
Contractors’ management costs
Subcontracts development
HAZOP constructability studies by contractor

Equipment/packaged systems and bulk materials

All direct equipment and bulk materials costs including:
- Elements of vendor design and engineering within packaged equipment
- Delivery
- Capital spares

But excluding:
- Costs of Procurement, expediting and inspection teams

Construction

Site preparation
All contractor activities from site prep to pre-commissioning
All associated support costs, for example:
- Infrastructure
- Temporary services, consumables
- Site accommodation and site access
- Cranage and construction equipment

Contractor-supplied materials if within construction contract

Commissioning

Contractor commissioning assistance e.g.
- Specialist leak testing
- Plant tests with raw material

First fill of lubricants
Drying out of refractory materials
Temporary supplies, systems and generators

ACTIVE PROJECT COST SAVINGS

PROJECT NAME:

NOMINAL VALUE (1): M£

SANCTION DATE (2)

COMPLETION DATE (3)

SAVINGS AS % OF PRE-SANCTION COST OUTLOOK(4)			
COST CATEGORY(4a)	PRE SANCTION(4b)	POST SANCTION(4b)	TOTAL
Pre sanction costs Owners costs Engineering Equipment/packaged systems Bulk materials Construction Commissioning			
TOTAL			

KEY ACTIVE SAVINGS CONTRIBUTORS(5)	
ACTIVE PRINCIPLES(6)	% ESTIMATE(7)
1. Effective Project Concept and Definition 2. Effective Project Team Management 3. Effective Supply Chain Relationships 4. Effective Information Management and Communication 5. Effective Project Risk Management 6. Effective Innovation and Continuous Improvement 7. Effective Project Execution 8. Effective Performance Measurement	
TOTAL	(9)

SCHEDULE CREDITS %(10)	(11)

SCHEDULE INDEX(12)	

NOTES	
(1)	To avoid any proprietary information issues, only a nominal value without specific accuracy is required. Units are £ millions
(2)	Date of funds approved or appropriated
(3)	Mechanical completion date prior to start up, or date of beneficial production. The latter is preferable if available
(4)	ALL NUMBERS IN THIS TABLE TO BE EXPRESSED AS A PERCENTAGE OF THE COST OUTLOOK PRE-PROCESS DESIGN i.e. FOLLOWING DESIGN BASIS DEFINITION, TO THE NEAREST 1%
(4a)	See ACTIVE Workbook notes for examples
(4b)	Split savings into pre sanction and post sanction only if available
(5)	Breakdown of the total percentage of savings by active principle contributions. The percentage split of each (7) should be an estimate based on judgement.
(6)	See workbook section 2 for details of active principles
(7)	Contributions to be expressed as a % of cost outlook pre process design
(8),(9)	These totals should be the same
(10)	SAVINGS DUE TO REDUCED SCHEDULE (e.g. EARLIER CREDITS) EXPRESSED AS A PERCENTAGE OF PRE-DESIGN COST OUTLOOK(11). Actual schedule/pre-process design schedule outlook.

SECTION 4

IMPLEMENTATION

ASSESSMENT CHECK LISTS

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ACTIVE WORKBOOK ASSESSMENT

ASSESSMENT CHECK LIST: REVIEW No. 1

PROJECT: **DATE:**

REVIEW NO: 1 of 5

ACTIVE PRINCIPLE	**SCORE:** 1 2 3 4 5 N/A	**See VEP**
AP1: Effective Project Concept and Definition		
AP1/1 To what extent is the project process defined for the project?		1.1
AP1/2 Has a project owner been appointed?		1.1
AP1/3 Has a project manager been appointed?		1.1
AP1/4 Are the objectives for the project clear?		1.1
AP1/5 Are the deliverables for each stage of the project defined?		1.1
AP1/6 Are the boundaries of the project clear?		1.2
AP1/7 Have the project objectives been rigorously tested with the project owner?		1.2
AP1/8 Have those parties who will be executing the project been involved in the definition?		1.2
AP1/9 Is there a good understanding of the key business requirements of the project?		1.2
AP1/10 Are the appropriate tools to plan the project available?		1.3

AP1/11 Are key roles and responsibilities defined for the project?		1.3
AP1/12 Have the project objectives and scope been tested by value analysis?		1.4
AP1/13 Has evaluation of options on the basis of life cycle costs been applied?		1.4
AP1/14 Has the project held value workshops?		1.4
AP1/15 Has a Safety, Health and Environment policy been prepared for the project?		1.5
AP1/16 Have individuals/organisations been appointed with specific responsibility for Safety, Health and Environment?		1.5
AP1/17 Has an information management policy for the project been issued?		1.6
AP1/18 Is the procurement policy for the project clear?		1.7
AP2: Effective Project Team Management		
AP2/1 Has a clear auditable process been put in place for the selection of project participants?		2.1
AP2/2 Has the project team been appointed?		2.1
AP2/3 Has psychometric testing been used to check the balance of the team?		2.1
AP2/4 Has the project organisation been decided?		2.1
AP2/5 Has the team been able effectively to challenge project assumptions?		2.1

AP2/6	Is a process in place to enable innovative ideas to be developed and adopted?		2.1
AP2/7	Has a framework for effective team communications been put in place?		2.1
AP2/8	Have aggressive, achievable targets been set for the team?		2.1
AP2/9	Are a set of co-ordination procedures in place		2.1
AP3:	**Effective Supply Chain Relationships**		
AP3/1	Has a policy statement on business ethics been agreed for the project?		3.1
AP3/2	Have alliance or partnering arrangements been considered for all or part of this project?		3.1
AP3/3	Has the need for non-adversarial relationships been recognised in setting up this project?		3.1
AP3/4	Is the scope of the project sufficiently well defined to define the roles and responsibilities of the major contractors and suppliers?		3.1
AP3/5	Have the types of contract to be used on the project been decided?		3.1
AP3/6	Has the project started a process of gathering supply market intelligence?		3.2
AP3/7	Have the strategic contractor and supplier requirements been determined?		3.2
AP3/8	Where an alliance or partnership is proposed, has a process for partner selection been put in place?		3.2

AP3/9	Is the project committed to adopting a contract dispute resolution process using ADR (Alternative Dispute Resolution) procedures?		3.3
AP4:	**Effective Information Management and Communications**		
AP4/1	Has an information management strategy been prepared for the project?		4.1
AP4/2	Have the information needs of project participants been defined for each stage of the project?		4.1
AP4/3	Has an effective communications strategy been defined?		4.1
AP5:	**Effective Project Risk Management**		
AP5/1	Have the objectives for a risk management process for the proejct been agreed?		5.1
AP5/2	Have the risks in the project been identified and, where appropriate, quantified?		5.1
AP5/3	Have appropriate techniques been used to analyse risks?		5.1
AP5/4	Have risk management action plans been drawn up and is the responsibility for managing each risk assigned?		5.1
AP5/5	Are contingency plans agreed for the major risks?		5.1
AP5/6	Has the balance of risk and benefit with the major supply chain partners involved in the project been agreed?		5.2

AP5/7	Has the use of risk and benefit framework agreements with contractors and key suppliers been considered for the project?		5.2
AP5/8	Have discussions been held with potential supply chain partners on the potential for risk and benefit framework agreements?		5.2
AP5/9	Have quantifiable key success criteria for risk and benefit framework agreements been developed for the project?		5.2
AP6:	**Effective Innovation and Continuous Improvement**		
AP6/1	Has a corporate and project strategy for continuous improvement been established?		6.1
AP6/2	Have integrated work groups been set up to review improvement opportunities and identify specific areas?		6.1
AP6/3	Have any specific areas for improvement been identified by workgroups?		6.1
AP6/4	Have improvement targets been established for the project?		6.1
AP6/5	Have individuals on the project been set personal performance targets for improvement?		6.1
AP6/6	Has learning from other projects been identified and been used to improve performance on the current project?		6.1
AP6/7	Have opportunities for innovation been identified which could overcome specific problem areas on the project?		6.2

AP6/8	Is there a process in place to capture and evaluate innovative ideas?		6.2
AP6/9	Have innovative ideas been sought from supply chain partners at an early stage of project development?		6.2
AP6/10	Do the contractual arrangements in place encourage innovation and ideas for improvement from supply chain partners?		6.2
AP6/11	Have confidentiality and intellectual property issues been addressed?		6.2
AP6/12	Has a challenge culture been established in the integrated project team?		6.2
AP6/13	Is a process in place to test innovative ideas and ensure that they contribute to project objectives at an acceptable level of risk?		6.2
AP7:	**Effective Project Execution**		
AP7/1	Has the project control process been defined for the project?		7.1
AP7/2	Has the format for reporting on project progress throughout all project stages been defined?		7.1
AP7/3	Have the key measures for each stage of the project been defined and reporting and control mechanisms put in place?		7.1
AP7/4	Has the basis for project design been agreed?		7.2
AP7/5	Has constructability been included as a key component of the project strategy?		7.3

AP7/6	Are the basic standards for the project defined?		7.4
AP7/7	Is the future operating team involved in the project definition process as part of the team?		7.5
AP8:	**Effective Performance Measurement**		
AP8/1	Are the processes and procedures to be used on the project well understood?		8.1
AP8/2	Has a benchmarking model for the process been identified, either in-house or with a benchmarking company?		8.1
AP8/3	APre the key measures of performance for the project well understood?		8.1
AP8/4	Is the procurement process to be employed on the project well understood?		8.2
AP8/5	Are the procurement goals for the project defined?		8.2

ACTIVE WORKBOOK ASSESSMENT

ASSESSMENT CHECK LIST: REVIEW No. 2

PROJECT: **DATE:**

REVIEW NO: 2 of 5

ACTIVE PRINCIPLE	**SCORE:** 1 2 3 4 5 N/A	**See VEP**
AP1: Effective Project Concept and Definition		
AP1/1 Is the process for project sanction/authorisation clear?		1.1
AP1/2 Have the project objectives been communicated to the project team?		1.1
AP1/3 Has the scope of the project been defined?		1.1
AP1/4 Has a project execution strategy been completed and agreed?		1.1
AP1/5 Have detailed estimates and schedules been prepared?		1.1
AP1/7 Has the concept of functional specifications been adopted by the project?		1.2
AP1/8 Have the design standards for the project been agreed?		1.2
AP1/9 Have forecasts of costs and resources been prepared to the appropriate accuracy?		1.3
AP1/10 Has a detailed work breakdown structure been completed?		1.3
AP1/11 Has the final project plan been agreed?		1.3

AP1/12	Has the critical path for the project been determined?		1.3
AP1/13	Has the Value Analysis process been completed for definition?		1.4
AP1/14	Have Hazops and other front end SHE procedures been completed for the project?		1.5
AP1/15	Has an information management strategy been prepared for the project?		1.6
AP1/16	Is the project using IT systems and other tools to aid communications and information sharing?		1.6
AP1/17	Has a procurement strategy been prepared?		1.7
AP1/18	Has the criticality matrix been used to help establish the appropriate strategy towards contractors and suppliers?		1.7
AP1/19	Have partnering and alliance type contracts been considered?		1.7
AP2:	**Effective Project Team Management**		
AP2/1	Is the project team working together well?		2.1
AP2/2	Is the team working to a set of agreed, common critical success factors for the project?		2.1
AP2/3	Are the roles and responsibilities of everyone on the project clear and unambiguous?		2.1
AP2/4	Has a system of assessment and appraisal of project team staff been put in place?		2.1

AP2/5	Has the capability of the team been assessed and training completed where there are deficiencies?		2.1
AP2/6	Have peer reviews been used to review the effectiveness of project activities?		2.1
AP2/7	Have team building events been held and how effective have they been?		2.1
AP2/8	Are processes in place to measure team effectiveness throughout the project?		2.1
AP2/9	Are the team motivated and is there a process for recognising and rewarding achievement?		2.1
AP2/10	Is a system in place for the management of change and is it working effectively?		2.1
AP2/11	Is an effective two-way communication process happening on the project?		2.1
AP2/12	Are the team leaders displaying good leadership which draws out the full potential of the team?		2.1
AP2/13	Have ‘stretch’ targets been set for the team and are they being achieved?		2.1
AP3:	**Effective Supply Chain Relationships**		
AP3/1	Has a framework for business ethics and conduct been agreed and shared with supply chain partners?		3.1
AP3/2	Have targets been set with supply chain companies for improving safety and protecting the environment?		3.1

AP3/3	Have critical success factors been established and agreed for any alliance or partnership on the project?		3.1
AP3/4	Is the Alliance or partnership operating as a single integrated team?		3.1
AP3/5	Are contract behaviours on the project co-operative rather than adversarial?		3.1
AP3/6	Has sufficient effort been put into defining the scope of the key contracts for the project?		3.1
AP3/7	In defining the contracts for the project, do the payment terms take account of the cash flow needs of both buyers and sellers?		3.1
AP3/8	Has a process of supplier evaluation been employed before issuing enquiry documents?		3.2
AP3/9	Has the process of tender evaluation been shared with all bidders?		3.2
AP3/10	Has a process for the equitable resolution of contract disputes been built into contracts?		3.3
AP4:	**Effective Information Management and Communications**		
AP4/1	Has the transfer of information from definition to the detailed design phase been effectively managed?		4.1
AP4/2	Are the formats and systems defined for information management?		4.1
AP4/3	Have life cycle codes which will maintain information currency been agreed within the project team?		4.1

AP4/4	Is the information management strategy working effectively?		4.1
AP4/5	Have all the supply chain partners been involved in defining the information requirements?		4.1
AP4/6	Has a strategy for contract documentation which eliminates inefficiencies and waste been agreed?		4.1
AP5:	**Effective Project Risk Management**		
AP5/1	Is a formal risk management process in place for the project?		5.1
AP5/2	Has risk awareness been raised within the project team?		5.1
AP5/3	Are any special tools etc in place to enable risks to be analysed and managed throughout the project?		5.1
AP5/4	Has the risk identification process been completed?		5.1
AP5/5	Are the project contractors, suppliers as well as the project owner fully involved in the risk management programme?		5.1
AP5/6	Have all risk analyses been completed?		5.1
AP5/7	Has there been agreement within the project team on how each risk will be handled?		5.1
AP5/8	Have any risk and framework agreements been put in place on the project?		5.2

AP5/9	Do any risk and benefit framework agreements properly apportion risks and benefits equitably between the participants?		5.2
AP5/10	Are the framework agreements operating within the spirit of the ACTIVE principles?		5.2
AP6:	**Effective Innovation and Continuous Improvement**		
AP6/1	During the definition process have specific areas for improvement been identified?		6.1
AP6/2	Are improvement objectives defined and targets set?		6.1
AP6/3	Have improvement methods been defined and programmes in place to implement these?		6.1
AP6/4	Are integrated work groups identifying areas of performance improvement which will improve the chances of project success?		6.1
AP6/5	Has training been carried out within the project team to generate a challenge culture and promote improvement thinking?		6.1
AP6/6	Have benchmarks been identified for ensuring that improvement targets are challenging?		6.1
AP6/7	Has a process for capturing learning on the project been put in place?		6.1
AP6/8	Have supply chain partners contributed to the project definition process and been free to challenge and test assumptions and ideas?		6.2

AP6/9	Have contractual arrangements been established which encourage and reward innovative ideas which enhance achievement of project objectives?		6.2
AP6/10	Has innovation been applied to the business processes which will be applied on the project?		6.2
AP6/11	Have intellectual property rights been protected and confidentiality maintained in such a way that innovation is encouraged?		6.2
AP6/12	Have positive incentives encouraging innovation been built into contracts with vendors?		6.2
AP6/13	Is the project team located in an open plan multifunctional office where sharing ideas can flourish?		6.2
AP6/14	Is the process for evaluating and assessing new options and ideas working effectively?		6.2
AP6/15	Have any 'peer' reviews been held to test proposals and share learning?.		6.2
AP7:	**Effective Project Execution**		
AP7/1	Are the project reporting mechanisms defined, in place and working smoothly?		7.1
AP7/2	Have all the key measures for each stage of the project been defined and the tools and techniques put in place to obtain the information?		7.1
AP7/3	Are the project roles and responsibilities clear in terms of control of all aspects of the project?		7.1

AP7/4	Is the project programme being used to monitor the progress of the project?		7.1
AP7/5	Are resources being made available in accordance with the requirements of resource plans?		7.1
AP7/6	Are mechanisms in place and working for forecasting the anticipated final cost (AFC) for the project on an ongoing basis?		7.1
AP7/7	Are timely relevant reports being produced and used for project control?		7.1
AP7/8	Is a change control procedure in place and working effectively?		7.1
AP7/9	Have the project definition requirements been effectively communicated to the design team?		7.2
AP7/10	Has the design team been fully integrated and aligned with the overall objectives of the project?		7.2
AP7/11	Does the design team have the right mix of skills and competencies to meet the design needs of the project?		7.2
AP7/12	Are the most appropriate design tools and systems available for this stage of the project?		7.2
AP7/13	Have the design criteria and standards been agreed for the project?		7.2
AP7/14	Has the design team developed whole life costing criteria for design decision making and assessment?		7.2
AP7/15	Has the design communications strategy been defined?		7.2

AP7/16	Is the design process to be audited regularly?		7.2
AP7/17	Is the construction manager appointed and working as part of the project team during the definition and design phases?		7.3
AP7/18	Has the construction methodology been agreed and communicated to the design team?		7.3
AP7/19	Is a programme of constructability reviews being implemented?		7.3
AP7/20	Has the design programme been developed taking full account of the requirements of construction?		7.3
AP7/21	Has the project adopted recognised standards and materials specifications for design?		7.4
AP7/22	Has a policy of functional specification for standard items been adopted on the project?		7.4
AP7/23	Has a policy on the setting of design contingencies and safety factors been agreed?		7.4
AP7/24	Are the requirements of the commissioning and operating teams clear and are they integrated into the design process?		7.5
AP8:	**Effective Performance Measurement**		
AP8/1	Have key measures been defined for the project definition stage and has performance during this stage been benchmarked?		8.1
AP8/2	Has a flowchart of procurement activities been defined and key performance indicators identified?		8.2

ACTIVE WORKBOOK ASSESSMENT

ASSESSMENT CHECK LIST: REVIEW No. 3

PROJECT: **DATE:**

REVIEW NO: 3 of 5

ACTIVE PRINCIPLE	**SCORE:** 1 2 3 4 5 N/A	**See VEP**
AP1: Effective Project Concept and Definition		
AP1/1 Is the project process agreed at the outset still being applied?		1.1
AP1/2 Are the construction and start up teams clear on project objectives?		1.1
AP1/3 Does the detailed design meet the requirements of the project scope?		1.2
AP1/4 Have functional specifications been used within the project?		1.2
AP1/5 Has the construction programme been agreed with subcontractors?		1.3
AP1/6 Has formal value engineering been applied during the design process?		1.4
AP1/7 Have the results of SHE reviews been built into the design?		1.5
AP1/8 Are records of key decisions impacting on SHE being maintained?		1.5
AP1/9 Has the information management strategy been effective during the design phase of the project?		1.6

AP1/10 Has an effective process for prequalification and supplier selection been put in place?		1.7
AP2: Effective Project Team Management		
AP2/1 As the project moves into the construction phase, are the selection processes for participants in the project still being effectively applied?		2.1
AP2/2 To what extent are the critical success factors established at the outset for the team being realised?		2.1
AP2/3 Are roles and responsibilities on the project still clear?		2.1
AP2/4 Are performance reviews and appraisals of individuals being routinely applied?		2.1
AP2/5 Are induction sessions and team building events being held for those joining the project?		2.1
AP2/6 Are the efforts of team members being recognised and rewarded as project milestones are reached?		2.1
AP2/7 Is the project being adequately resourced to meet the project targets?		2.1
AP2/8 Is the working environment and supporting tools and systems conducive to effective working?		2.1
AP2/9 Have the design team been challenging and testing alternative ways of better achieving project goals?		2.1

AP2/10	Are communications within the project team good?		2.1
AP2/11	Is the project team inspired by good leadership?		2.1
AP2/12	Are the targets set for each project milestone being achieved or bettered?		2.1
AP3:	**Effective Supply Chain Relationships**		
AP3/1	Has the project been audited to ensure ethical standards are being maintained within the supply chain?		3.1
AP3/2	If an alliance or partnership is in operation, are all the parties satisfied with the working relationships with their partners?		3.1
AP3/3	Are partner/alliance type relationships being considered for construction sub-contracts?		3.1
AP3/4	Is there still a single integrated team approach operating across the supply chain on the project?		3.1
AP3/5	Has the contract scope grown as a result of detailed design work?		3.1
AP3/6	Are the roles and responsibilities across the supply chain still clear?		3.1
AP3/7	Has a ‘functional’ approach been employed in defining the scope for vendors?		3.1
AP3/8	Has the right type of contract been employed for the definition and detailed design stage of the project?		3.1
AP3/9	In awarding contracts, has a proper supplier selection process been employed?		3.2

AP3/10 Has the contract dispute procedures built into contracts been invoked and, if so, have disputes been successfully resolved?		3.3
AP4: Effective Information Management and Communications		
AP4/1 Is a mechanism in place for the transfer of information from design to the construction team?		4.1
AP4/2 Are the designed information formats aiding the communication process as the project moves into the construction phase?		4.1
AP4/3 Is the contract documentation serving a useful purpose in the execution of the project?		4.1
AP4/4 Is the documentation generated on the project being used or only being provided to cover the sender?		4.1
AP4/5 Has the use of life cycle codes meant that everyone understands the currency and status of issued documents?		4.1
AP4/6 Are the information systems used on the project providing rapid access to information by those who need to use it?		4.1
AP4/7 Has single point data entry been a feature of the project or is data constantly being re-entered as the project progresses?		4.1

AP5:	**Effective Project Risk Management**		
AP5/1	Has the risk register been reviewed to see if it is up to date?		5.1
AP5/2	Are the strategies developed for mitigating or dealing with the risks working properly?		5.1
AP5/3	Has the risk profile changed and have new risks been identified?		5.1
AP5/4	Are risk and benefit framework agreements operating satisfactorily?		5.2
AP5/5	Have new risk and benefit framework agreements been considered for the project's construction phase?		5.2
AP5/6	Are milestone targets for any risk and benefit framework agreements being achieved?		5.2
AP6:	**Effective Innovation and Continuous Improvement**		
AP6/1	Has the continuous improvement process worked effectively through the detailed design stage?		6.1
AP6/2	Have methods been established and programmes defined for the implementation of improvements?		6.1
AP6/3	Is feedback on the progress and performance of improvements being captured and regularly reviewed?		6.1
AP6/4	Are improvements being tested against the project objectives to ensure targets are being achieved?		6.1

AP6/5	Are individuals being regularly appraised to check achievement of personal improvement targets?		6.1
AP6/6	Are innovative approaches being adopted during the construction phase of the project?		6.2
AP6/7	Are construction contractors and equipment vendors being brought into the innovation and continuous improvement process?		6.2
AP6/8	Have supply chain partners seen reward for innovative ideas and have intellectual property rights been protected?		6.2
AP6/9	Is a challenge culture still operating within the project team?		6.2
AP6/10	Are ideas continuing to be captured and reviewed?		6.2
AP7:	**Effective Project Execution**		
AP7/1	Is the project under control in terms of cost, time, resources and changes?		7.1
AP7/2	Is the project programme being used to monitor and control progress?		7.1
AP7/3	Is the regular forecasting process still in place to enable ongoing control of project events and costs?		7.1
AP7/4	Are resources being made available in line with the resourcing plan?		7.1
AP7/5	Is the reporting system on progress still working effectively?		7.1

AP7/6	Are changes being properly managed through the change control procedure?		7.1
AP7/7	Has the detailed design process been effective?		7.2
AP7/8	Has the output of the design process been properly communicated and handed over to the construction team?		7.2
AP7/9	Does the design output adequately reflect the design intent laid down in the project definition?		7.2
AP7/10	Have all the design documents been issued to the construction team?		7.2
AP7/11	Are mechanisms in place to ensure there is good feedback to the design team during construction?		7.2
AP7/12	Has the design review process been effective in capturing learning during design?		7.2
AP7/13	Has the constructability programme been completed during the design phase?		7.3
AP7/14	Have members of the construction team been involved in key design decision making?		7.3
AP7/15	Has the standards policy defined at the project outset been maintained during the detailed design stage?		7.4
AP7/16	Are the commissioning and handover requirements clear to the construction team?		7.5
AP7/17	Are the information requirements of the operating team being met during the construction phase?		7.5

AP8: Effective Performance Measurement		
AP8/1 Have the key deliverables for the detailed design stage been achieved and is the performance matching the best?		8.1
AP8/2 Based on performance measurement up to this point, has an action plan for improvement been drawn up?		8.1
AP8/3 Has design effectiveness on the project been measured and benchmarked?		8.1
AP8/4 Has data been gathered on the project on key indicator measures of performance?		8.1
AP8/5 Have supply chain partner relationships been benchmarked?		8.1
AP8/6 Have key performance indicators for procurement been defined and has actual performance been measured?		8.2
AP8/7 Is there a process for actioning procurement process improvements identified during the benchmarking process?		8.2

ACTIVE WORKBOOK ASSESSMENT

ASSESSMENT CHECK LIST: REVIEW No. 4

PROJECT: **DATE:**

REVIEW NO: 4 of 5

ACTIVE PRINCIPLE	**SCORE:** 1 2 3 4 5 N/A	**See VEP**
AP1: Effective Project Concept and Definition		
AP1/1 Has the project process been followed during the project?		1.1
AP1/2 Has the scope of the project envisaged at the outset been achieved?		1.2
AP1/3 Has the project execution strategy been effectively applied?		1.2
AP1/4 Have all the activities on the project programme been completed to physical completion of the asset?		1.3
AP1/5 Has a formal system for implementing value improvements been applied during project execution?		1.4
AP1/6 Has safety performance during construction been maintained?		1.5
AP1/7 Is the SHE dossier complete and ready for handover to the operating team?		1.5
AP1/8 Have communications and information availability been effectively handled during the construction phase?		1.6

AP1/9	Has the procurement strategy been effective in achieving completion of the plant?		1.7
AP2:	**Effective Project Team Management**		
AP2/1	Has the project team worked effectively together through the construction phase?		2.1
AP2/2	Have the critical success factors set for the team been achieved?		2.1
AP2/3	Are the roles and responsibilities within the team still clear and defined?		2.1
AP2/4	Has the project organisation been effective in delivering a mechanically complete plant?		2.1
AP2/5	Are performance appraisals of team members still being completed?		2.1
AP2/6	As the project is completed have those leaving the team been effectively debriefed?		2.1
AP2/7	Has the contribution of team members to the achievement of project milestones been adequately rewarded and acknowledged?		2.1
AP2/8	Has the working environment and supporting systems been conducive to effective performance by the team?		2.1
AP2/9	Has the achievement of project goals been aided by a challenging approach within the team?		2.1
AP2/10	Have team communications during the construction phase been good?		2.1

AP2/11 Has the team been effectively led through this phase of the project?		2.1
AP2/12 Have the targets set for the team at the outset been achieved?		2.1
AP3: Effective Supply Chain Relationships		
AP3/1 Have the business practices between supply chain parties been audited to ensure ethical standards are being maintained?		3.1
AP3/2 Is any alliance or partnership on the project working effectively and are disputes being satisfactorily resolved?		3.1
AP3/3 Are roles and responsibilities within the supply chain still clear on the project?		3.1
AP3/4 Have the contracts been effective in apportioning the risks and benefits of the project between the parties on an equitable basis?		3.1
AP3/5 Has there been a high level of contract disputes on the project?		3.3
AP3/6 Have the dispute resolution procedures been effective in resolving contract disputes?		3.3
AP4: Effective Information Management and Communications		
AP4/1 Has the use of information systems been effective in improving the communications with the site?		4.1
AP4/2 Has the information management strategy been effectively delivered during the construction phase of the project?		4.1

AP4/3	Have the information needs of the construction sub contractors and suppliers been effectively addressed?		4.1
AP4/4	Is the form in which information has been communicated been satisfactory?		4.1
AP4/5	Has the circulation of documentation been controlled and wasteful printing of duplicate or non-essential documentation been avoided?		4.1
AP4/6	Are the information requirements for the handover phase clear?		4.1
AP4/7	Is the contract documentation required for handover to operations available and complete?		4.1
AP4/8	Has the use of life cycle information codes helped the construction team?		4.1
AP5:	**Effective Project Risk Management**		
AP5/1	Have the objectives of the risk management programme been achieved?		5.1
AP5/2	Have the anticipated risks been managed such that the impact on the project outcome has been minimised?		5.1
AP5/3	Has risk awareness within the supply chain been a help in early identification of risks?		5.1
AP5/4	Has the risk register continued to be reviewed to take account of changes in the risk profile?		5.1
AP5/5	Have the risk management action plans been fully implemented?		5.1

AP5/6	Have the objective of any risk and benefit framework agreements been achieved?		5.2
AP5/7	Are participants in agreement and satisfied with the outcome of the risk and benefit framework agreements?		5.2
AP5/8	Have the targets for key success criteria in the risk and benefit framework agreements been achieved?		5.2
AP6:	**Effective Innovation and Continuous Improvement**		
AP6/1	Has the process of continuous improvement been applied through all the stages of the project?		6.1
AP6/2	Have improvements implemented during the project resulted in improved project performance?		6.1
AP6/3	Has feedback from improvements been recorded and used as a basis for further improvement?		6.1
AP6/4	Have improvement targets been achieved?		6.1
AP6/5	Have improvements on the project set a new benchmark of performance?		6.1
AP6/6	Has learning from improvements on the project been recorded and shared outside the current project?		6.1
AP6/7	Has the project team reviewed what went well, what didn't go well and why?		6.1

AP6/8	Have supply chain partners been fully involved and committed to the improvement and innovation process?		6.2
AP6/9	Have individuals and companies been fairly rewarded for new ideas and improvements which have benefited the project?		6.2
AP6/10	Where agreed necessary, has confidentiality been maintained on the project?		6.2
AP6/11	Has the challenge culture led to performance improvement or merely disrupted the project programme and led to inefficiency?		6.2
AP6/12	Have novel ideas which were not adopted on the project been captured and recorded for the future?		6.2
AP6/13	Has the process for reviewing ideas and improvements and capturing lessons learnt operated effectively?		6.2
AP7:	**Effective Project Execution**		
AP7/1	Has the project programme continued to be used to control project progress?		7.1
AP7/2	Are project reporting procedures still effective in communicating project progress and stimulating corrective action?		7.1
AP7/3	Is the change management procedure still effective in limiting scope growth?		7.1
AP7/4	Has there been a good level of design support available during the construction phase?		7.2

AP7/5	Has the construction input during definition and design resulted in improved construction performance?		7.3
AP7/6	Have the key standards set at the project outset been maintained during the construction phase?		7.4
AP7/7	Have parts of the plant or systems supplied by separate vendors been successfully integrated during the construction phase?		7.4
AP7/8	Has the use of vendor standard designs speeded up the procurement and installation process?		7.4
AP7/9	Has the handover process from construction to commissioning been well handled?		7.5
AP7/10	Has the construction programme reflected the requirements of the commissioning team and matched required handover timings		7.5
AP7/11	Have regular meetings been held during construction with the commissioning team to ensure a smooth handover?		7.5
AP7/12	Have commissioning systems been defined for the plant and a phased start up programme developed?		7.5
AP7/13	Have inspections and precommissioning checks been defined and wasteful repetition and duplication eliminated?		7.5
AP7/14	Has a defined process of handover, including qualified and final handover procedures, been put in place?		7.5

AP8: Effective Performance Measurement		
AP8/1 Has the measurement of performance during project execution resulted in improvements in what has been achieved?		8.1
AP8/2 Has any benchmarking indicated superior project performance compared with in-house or industry-wide projects of a similar type?		8.1
AP8/3 Has supply chain benchmarking resulted in better relationships within the project team?		8.1
AP8/4 Have the action plans resulting from measurement and benchmarking been useful in driving change and improvement?		8.1
AP8/5 Has the performance of the procurement process improved over the life of the project?		8.2

ACTIVE WORKBOOK ASSESSMENT

ASSESSMENT CHECK LIST: REVIEW No. 5

PROJECT: **DATE:**

REVIEW NO: 5 of 5

ACTIVE PRINCIPLE	**SCORE:** 1 2 3 4 5 N/A	**See VEP**
AP1: Effective Project Concept and Definition		
AP1/1 Is the project owner satisfied that the project objectives have been met?		1.1
AP1/2 Has a project review been completed?		1.1
AP1/3 Has the project process been followed through all the project stages?		1.1
AP1/4 Is the project programme complete?		1.3
AP1/5 Have the value improving measures identified in definition delivered the expected benefit?		1.4
AP1/6 Has the plant satisfied all the SHE targets for the project?		1.5
AP1/7 Have all environmental reviews been completed?		1.5
AP1/8 Was the information handover from the project team to the operating team effective?		1.6
AP1/9 Has the procurement policy adopted for the project been successful?		1.7

AP2:	**Effective Project Team Management**		
AP2/1	Have the critical success factors for the project team been achieved?		2.1
AP2/2	Were the roles and responsibilities clear throughout the project?		2.1
AP2/3	Has a regular and effective system of appraisal and performance assessment been applied to individuals working on the project?		2.1
AP2/4	Have peer reviews been used on the project and has the feedback been useful?		2.1
AP2/5	Has team effectiveness been maintained throughout the project?		2.1
AP2/6	Was the team effectively debriefed at the end of the project?		2.1
AP2/7	Have the lessons learned during the project been effectively captured and shared with other projects?		2.1
AP2/8	Have individuals been suitably rewarded and recognised for the contribution they made to the project?		2.1
AP2/9	With hindsight, has the project team organisation been effective in achieving the project objectives?		2.1
AP2/10	Has the leadership of the project been maintained through the handover stage to the operating team?		2.1
AP2/11	Have the project team targets all been achieved?		2.1

AP3:	**Effective Supply Chain Relationships**		
AP3/1	Have high business ethical standards been maintained throughout the project?		3.1
AP3/2	Have all statutory and mandatory requirements on the project been met?		3.1
AP3/3	Has any alliance or partnership been successful on the project as perceived by all the parties involved?		3.1
AP3/4	Has the operation of the alliance resulted in benefits for the project owner and gainshare for the other participants?		3.1
AP3/5	Have working relationships in the supply chain been harmonious and co-operative?		3.1
AP3/6	Has there been significant scope growth in the project?		3.1
AP3/7	Did the selection of the type of contract result in the most effective project outcome?		3.1
AP3/8	Have payments to vendors been made promptly within the contract terms?		3.1
AP3/9	Has the supply chain performance on this project enabled longer term ongoing relationships to be developed with key vendors?		3.1
AP3/10	Did the supplier selection process result in the best vendor being awarded the contract?		3.2
AP3/11	Were the contract dispute resolution procedures effective in maintaining good relationships with satisfactory results for all parties?		3.3

AP4: Effective Information Management and Communications		
AP4/1 Has the implementation of the information management strategy resulted in benefit to the project?		4.1
AP4/2 Has information passed seamlessly across the boundaries of each phase of the project without the need for re-entry of data?		4.1
AP4/3 Has the single entry of data policy resulted in less errors due to mistakes?		4.1
AP4/4 Has all the contract documentation been handed over?		4.1
AP4/5 Are the information requirements from the project team for the ongoing operation of the plant clear?		4.1
AP4/6 Has all the essential design and SHE data necessary for operations been handed over from the project to the operating team?		4.1
AP4/7 Now the project is complete, is it still possible to access ongoing plant and project information quickly?		4.1
AP4/8 Have the life cycle information codes been useful in determining which information should be retained at the end of the project?		4.1
AP5: Effective Project Risk Management		
AP5/1 Has the risk management process applied to the project been successful in mitigating and managing the risks to the benefit of the project?		5.1
		5.1

AP5/2	Has risk awareness been successful throughout the project supply chain?		5.1
AP5/3	Were the number of unknown risks minimised by the application of the risk management process?		5.1
AP5/4	Was it necessary to invoke contingency plans to deal with known risks that actually occurred ?		5.1
AP5/5	Was a review carried out at the end of the project to capture learning on dealing with risks to future projects?		5.2
AP5/6	Have any risk and benefit framework agreements delivered benefits to the participants and were they in line with performance?		5.2
AP5/7	Has a review of the learning from any risk and benefit framework agreements been held with the participants?		5.2
AP5/8	Have the relationships formed within risk and benefit framework agreements been supportive and aligned?		
AP6:	**Effective Innovation and Continuous Improvement**		6.1
AP6/1	Has the application of a strategy of continuous improvement resulted in enhanced project performance?		6.1
AP6/2	How do improvements compare with benchmarks within the industry?		6.1
AP6/3	Have improvement targets been achieved and delivered benefit?		6.1

AP6/4	Have individuals been recognised and rewarded for performance improvements?		6.1
AP6/5	Has a formal project close out review to assess lessons learned from the improvement process been held?		6.1
AP6/6	Have the lessons learned been widely shared with other projects and others who can benefit from the experience?		6.2
AP6/7	Has the involvement of the supply chain in the improvement and innovation process benefited the project?		6.2
AP6/8	Has the rewarding of new ideas and protection of intellectual property been effectively handled during the project?		6.2
AP6/9	Have the contractual arrangements been successful in encouraging a challenge culture and enabling innovation to flourish?		6.2
AP6/10	Have new ideas and innovations been implemented without disruption to the project process?		7.1
AP7:	**Effective Project Execution**		
AP7/1	Was the project successfully controlled through all its phases for time, cost, resources, scope and performance?		7.1
AP7/2	Are the outcomes of the project in line with the forecasts from the project control systems?		7.1
AP7/3	Have the project reporting procedures been timely and accurate in highlighting key project information?		7.1

AP7/4	Have there been a large number of changes during plant start up?		7.1
AP7/5	Have changes been well managed throughout the project?		7.2
AP7/6	Has the plant design been sound in terms of initial plant start-up and operation?		7.2
AP7/7	Has the design intent been effectively communicated to the operating team?		7.2
AP7/8	Have innovations and improvements built into the design paid off in terms of improved operating performance?		7.2
AP7/9	Have the design, construction and commissioning teams been well integrated?		7.2
AP7/10	Are mechanisms in place to feed back operating experience to the design team to improve performance in the future?		7.3
AP7/11	Has the learning from constructability reviews been captured for future projects?		7.4
AP7/12	Were the standards set for the project appropriate for the needs of the operating plant or has it been under/over designed?		7.4
AP7/13	Were all the defined standards requirements met by the project?		7.4
AP7/14	Has the use of functional specifications and vendor standard designs produced a better plant?		7.5
AP7/15	Was the plant handed over from construction to the commissioning team in a smooth and successful way?		7.5

AP7/16	Was the handover from commissioning to the operating team successful?		7.5
AP7/17	Was all the required information available at handover from construction?		7.5
AP7/18	Have all the outstanding snags identified at handover been cleared?		8.1
AP8:	**Effective Performance Measurement**		
AP8/1	Has overall project performance been benchmarked against industry norms?		8.1
AP8/2	Is the benchmarked project performance as good as the best?		8.1
AP8/3	Are actions to improve future projects being put in hand?		8.1
AP8/4	Has project supply chain performance been benchmarked?		8.1
AP8/5	Is supply chain performance at least as good as the industry best?		8.1
AP8/6	Are actions being taken to improve supply chain performance in the future?		8.2
AP8/7	Have the Key Performance Indicators for the procurement process been benchmarked?		8.2
AP8/8	Is procurement process performance at least as good as the industry best?		8.2
AP8/9	Has an action plan been defined for improving procurement process performance?		

SECTION 5

INTER-ACTIVE NETWORK

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SECTION 5

INTER-ACTIVE NETWORK

5.1 Inter-ACTIVE: The Value Enhancement Network of ACTIVE

The five Working Groups of ACTIVE were formed with the primary objective of defining best practice in each of the following areas : Effective Project Execution, Procurement, Information Management, People and Behaviour, and Measurement. The output from the Working Groups is incorporated in the ACTIVE Principles and VEPs in this Workbook.

The role of the Working Groups has now changed and they now form part of Inter-ACTIVE, the Value Enhancement network of ACTIVE. Membership of the network consists of the ACTIVE stakeholder companies, members of the Engineering Suppliers and Contractors Group (ESCG) and registered ACTIVE pilot projects. In addition to members' support, another important contributor to Inter-ACTIVE is the recently-formed network on effective contracts-based projects set up by a group of companies, focused by Foster Wheeler and BP at BP Grangemouth.

ACTIVE is committed to encouraging the adoption of the ACTIVE Principles and VEPs in capital construction projects to assist with adding value and improving performance throughout the industry. To distribute and share this knowledge effectively, it is important that a network exists which promotes proper understanding of the practices and behaviour required, together with effective communication throughout the supply chain to facilitate the learning process needed for industry change. This is especially important for those undertaking projects, who will be able to use the network to provide help in the interpretation and application of the ACTIVE Principles and VEPs as they use this Workbook.

The network operates on a 'generic advice' basis, in order that confidentiality and competition law requirements are not compromised. Advice is only given on a 'without prejudice' basis and no liability is accepted for the consequences of decisions subsequently made by the project team.

The network organization is centred on the ACTIVE Secretariat which will 'broker' contacts where necessary and make appropriate arrangements for network activities to take place. Leadership and direction of the network stems from the Working Group chairmen and ESCG chairman working with the Secretariat as a sub-committee of the ACTIVE Management Board.

The activities of Inter-ACTIVE include:

- Maintenance and updating of the ACTIVE Workbook including the ACTIVE Principles and VEPs
- Publication of other documentation to provide further guidance on the application of ACTIVE Principles and VEPs
- Twice-yearly workshops on topics relevant to the furtherance of the ACTIVE Principles
- Publication and maintenance of an Inter-ACTIVE directory of contacts on specific topics. This will include regional contacts to promote the development of local networks within specific regions
- Regular reports and communications in ‘Activate’, the ACTIVE newsletter
- Provision of help and advice to registered ACTIVE pilot projects on the application of ACTIVE Principles and practices.
- Access to information via the ACTIVE website and through documents held by ACTIVE from other industry initiatives and academia

5.2 ACTIVE Contacts

5.2.1 ACTIVE Stakeholders

ABB Power Generation Ltd	Ernst Burger
ALSTOM Gas Turbines Ltd	Herman Ruijsenaars
AMEC BKW Ltd	John Farrow
AMEC Process and Energy Ltd	Tom Stammer
Anglian Water Services Ltd	Peter Cook
BASF Plc	Ian Fyfe
Bechtel Ltd	Yves Shama
BOC Process Plants	Neil Hegarty
BP International Ltd	Terry Lazenby
British Gas plc	Roger Fox
British Nuclear Fuels plc	Bill Heafield
Brown & Root AOC	Norman Hart
Brown and Root Energy Services Ltd	Richard Rumble
BT	Martin Buggy
Capper Engineering Services Ltd	David Bowman
Conoco Ltd	John Lamb
Costain Oil, Gas & Process Ltd	Bernard Cunningham
Courtaulds Engineering Ltd	Charles Dunn
DuPont (UK) Ltd	David Trueman
Elementis Chromium	Tony Maplesden
Exxon Chemicals (UK) Ltd	Chris Robinson
Fluor Daniel Ltd.	James McNicoll
Foster Wheeler Energy Ltd	Jon Liddle
Glaxo Wellcome Operations	Peter Russell
Hertel (UK) Ltd	John Burt
ICI Technology	Bowman Bradley
John Laing Construction Ltd.	David Lloyd
Kvaerner Process Ltd	Phil Levene
Kvaerner Redpath Engineering Services Ltd.	Derek Holliday
Ledwood Construction Ltd	Hugh Rees
M.W. Kellogg Ltd	John O'Sullivan
Mobil Services Company Ltd	Thomas Hall
Montell UK	Chris Fox
Mowlem Engineering Projects	Suzy Firkin
N.G. Bailey & Company Ltd.	James Kirk
National Power plc	Mike Parker

Parsons Group International Ltd	Jim Jenkins
Powergen plc	Terry Chappell
Rigblast Group Ltd	John Challen
Shell UK Ltd	Paul Zealand
Snamprogetti Ltd	Bill Eddy
Sterling Fluid Systems Ltd	Graham Terry
Stone & Webster	Martin Perham
Taylor Woodrow Management	Alan Chalmers
Texaco Ltd	Ian Gregson
UK Construction & Engineering Company Ltd.	John Collings
Value Management Ltd	Brian Norton

5.2.2 ACTIVE Management Board

ACTIVE Secretariat	Arthur McQuillan
ACTIVE Secretariat	Ivor Williams
ACTIVE Secretariat	Stephen Weatherley
ABB Power Generation Ltd	Ernst Burger
ALSTOM Gas Turbines Ltd	Herman Ruijsenaars
Bechtel Ltd	Yves Shama
BP International Ltd	Bill Murdoch
BP International Ltd	Terry Lazenby
Burgess-Manning Ltd.	Peter Leppard
Capper Engineering Services Ltd	David Bowman
Costain Oil,Gas & Process Ltd	Bernard Cunningham
Department of Trade and Industry	Valerie Allcock
Engineering Construction Industry Assn	Brenig Williams
Exxon Chemicals (UK) Ltd	Chris Robinson
Fluor Daniel Limited	James McNicoll
Foster Wheeler Energy Ltd	Jon Liddle
Kvaerner Process Ltd	Phil Levene
Kvaerner Redpath Engineering Services Ltd.	Derek Holliday
National Power plc	Mike Parker
Rigblast Group Ltd	John Challen
Sterling Fluid Systems Ltd	Graham Terry
Stone & Webster	Martin Perham

5.2.3 ACTIVE Workgroups

Effective Project Execution Workgroup

Kvaerner Process Ltd	Duncan MacPhee (Chairman)
ABB Power Generation Ltd	Ken Shippen
AMEC-BKW Ltd	Chris Openshaw
Anglian Water Services Ltd	Paul Glass
BP International Ltd	Bill Murdoch
British Gas plc	Kevin Cross
Courtaulds Engineering Ltd	David Woods
Fluor Daniel Ltd	Bob Atkinson
Foster Wheeler Energy Ltd	Graeme Lang
Kvaerner John Brown Ltd	David Andrews
Kvaerner Redpath Engineering Services Ltd.	Roddy MacPherson
Laing Civil Engineering Ltd.	Philip Ball
Mitsui Babcock Energy Services	David Cowan
Rigblast Group Ltd	Neil Munro
Snamprogetti Ltd	Peter Skidmore
SIHI Pumps (UK) Limited	Andrew Warrington
Value Management Ltd	Brian Norton

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People & Behaviour Workgroup

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BP International Ltd	Tony Probert
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Useful reading: *No Business As Usual: An Extraordinary North Sea Result*

Written by Terry Knott and published by the British Petroleum Company.
The detailed account of the Andrew field development, winner of *The Project of the Year Award 1997* awarded by the Construction Industry Board and Department of the Environment.

Copies may be obtained from:
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