

TOOLS & METHODOLOGIES FOR DEVELOPING DECISION SUPPORT PACKAGES

White Paper Information from decades of implementation
experience with hundreds of Project / Portfolio engagements from
Pinnacle Results LLC & Leading Edge Collaboration LLC

Online Video Seminars: <https://pinnacresults.teachable.com/>

Pinnacle Results LLC : <http://www.pinnacresults.com>



August 21, 2022



James D McCuish M.B.I.M., C.V.S. is Managing Partner in Pinnacle Results LLC & a former member of BP's Integrated Business Modeling Team. He has served in both Management & Supervisory roles in Worldwide Operations for 40 years in Energy Related Businesses. He practices Value Engineering / Analysis, Decision Management / Analyses and Project Management. He has conducted VE Studies and Decision Management Analyses in Oil, Chemicals, and Exploration / Production Sectors & Manufacturing Industries. Mechanical Engineering at The Queen's University of Belfast & Dual degree, Syracuse University, in Management & in Business Administration; Summa Cum Laude, with University Honors in Management,
Contact: phone: 832-794-2028, james@pinnacresults.com

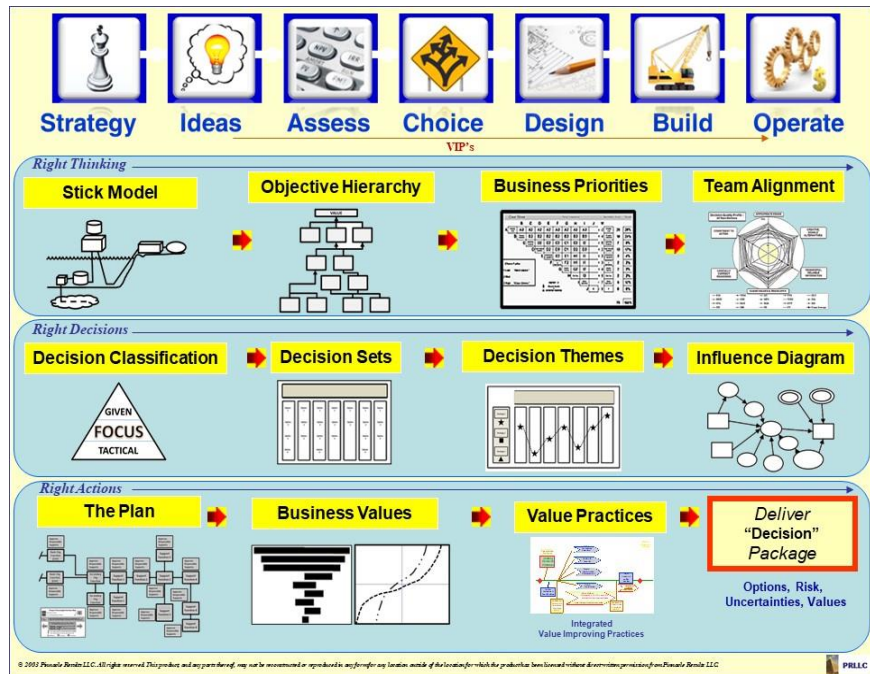


Charles W. Jennings A.V.S. has 40 years' CEO Leading Edge Collaboration has experience in upstream oil and gas production activities. He has worked in subsurface, well completions, Subsea design, production operations, and has lead project teams in Trinidad, Norway, Egypt, United Kingdom and the United States. He holds a BSME and MSME from Louisiana Tech University. He was an Appraise (FEL) Advisor with BP and supported Major Capital investment teams worldwide using front-end appraisal methodologies, value engineering, decision analyses and project management techniques. He is currently a Director in Pinnacle Results LLC and a Partner in Leading Edge Collaboration.
Contact: phone: 713-501-0574, charles@pinnacresults.com

1. INTRODUCTION

1.1 Scope

This Pinnacle Results / Leading Edge White Paper targets opportunities for Decision and Value professionals to develop proficiency in the Decision Framing and Analyses element of input to Decision, & Risk Analyses. This requires a mindset of "enquiry" and proficiency in various toolsets' application. Decision and Risk framing have many acceptable toolsets and project team interrogation techniques. This paper includes some demonstration toolsets which we have used extensively. It is important to differentiate between framing the Decisions to be made and the Risk methodologies for assessing the potential impact of the Decisions.



Most major project investment, management and delivery teams have adopted some form of phased capital investment technique, generally known as Front End Loading (FEL.) The genesis of these techniques is in the principle that thinking clearly and critically in a phased investment fashion in early stages, on all projects, will potentially result in only the "right" projects being progressed. Furthermore, any changes required are conducted before significant cost to affect change is incurred. This paper is not "short," however, to impart effective grounding in DA Framing principles and clarity of examples demands thorough description to be useful. The information is presented in 2 distinct and equally important sections (3) and (4) rather than a body and appendices. Finally (5) a short section on framing team insights, engagement planning and toolset summaries.

Section 1 : Focuses on high level underlying DA Framing development in the context of Classic Decision Analysis used by Decision Makers / Gate Keepers and Project Teams. This presents DA background aligned within the development of Decision Support Packages (DSPs). These are prescribed in Front End Loading / Stage and Gate

October 25, 2018

project advancement processes. As this section progresses to describe development of DSPs, some examples of applicable project team toolsets employed are briefly noted.

Section 2 : A detailed overview of some example toolsets and methodologies referenced in each step in Section 1 as applied for Decision Analysis / Decision Quality (DA / DQ) in DSP development. Some of these examples and their utilization date from the mid 1960s, others have been added and augmented since then. However, all of the example toolsets shown have been used extensively by hundreds of project teams and project management worldwide for well over 2 decades.

Decision Analysis techniques are very powerful in providing discernments to management decision making. As with all methods of analyses, these techniques are only as good as the quality of input provided by the Project Team, Management and Stakeholders. Additionally, the reader should remember neither the DA model nor the model outputs *make the decisions*. However, they do give rational insight for the Project Team and Management to make informed decisions in the face of uncertainty.

1.2 Purpose

This paper is intended to provide guidance with regard to established methodologies and example toolsets in support of developing formal project Decision Support Packages.

While many aspects of Decision Quality are well documented in industry and academic literature, the purpose of this paper is to go a little further and offer actionable guidance on DA/DQ application and example practices for project controls professionals, cost or risk analysts and project team workshop facilitators. To help ensure this guidance can be practically applied, the 1st section describes principles and guidelines to help facilitate an integrated cost engineering approach and DA participation, tracking project performance, collecting data as well as lessons learned on projects and injecting them into the industry accepted FEL Stage – Gate / DSP methodology.



1.3 Background

This paper overviews decision and risk analysis methods and toolsets relative to DSP development. These are examples rather than prescriptive guidelines, or specific team tools. However, they do represent approaches proven to be successful. It may take significant coaching and practice to effectively apply some of the DA toolsets. Other papers will address the interpretation of DA results and analyses, which are developed by the project team in delivery of a DSP.

Primary benefits arise as DSP development begins, and the integrated project team initiates project framing discussions. Examples of the requisite project framing discussion among the project team (and decision makers) include:

October 25, 2018

- What are we trying to accomplish?
- What are our goals and objectives?
- How does project delivery realize our business vision?
- What is important? What are the fundamental value drivers to our project?
- Are we ready to frame and execute our project within the appropriate business context?
- What are the key decisions within the project framework?
- What are potential alternatives that satisfy both the business boundaries and success criteria?
- Are there viable coherent data sets for all alternatives?
- How do the various entities interact and influence each other?
- What is the functional work activity plan?
- What plans are needed to identify decision inputs; and to select between compelling alternatives, based on (organizational) functional needs and not on preordained tasks or desires.
- For the viable alternatives, what does the business economic case look like, including uncertainties?
- How can value be improved and managed?
- Are there other choices that satisfy the intended functionality and offer improved holistic value? What are others doing within and outside of the industry?

There is work to be done, and applicable toolsets used, prior to engaging the team in decision framing which ensure effective discussion yet these are often excluded from documentation of classic DA/DQ steps in literature. However, examples are shown in this paper. These toolsets recognize that DQ analysis is nested within the overall front-end loading, management assessments, project delivery, execution and operation process.

PAPER SUMMARY

For clarity the *paper Summary* is shown here rather than traditionally at the end of the paper:

The applicability of DA/DQ nested within the FEL process for project advancement which has been developed for over 40 years, has proven effective and is well accepted by industry professionals. Cost engineering professionals are urged to become competent in utilizing a consistent and scalable DA/DQ methodology and/or participating in DA framing and risk analyses input.

Decision analysis and risk management have emerged as critical disciplines in the business and project management field. By taking advantage of a growing number of prescribed methodologies and tools, organizations are increasing their ability to manage uncertainty in the fiercely competitive global marketplace. For businesses, uncertainty poses both a downside—Threat—and an upside—Opportunity. Each is associated with levels of complexity. In the absence of a miracle *crystal ball* to see the future, decision analysis leading to decision quality, is the process competitive organizations can use to bring greater clarity to decision making. As a subset of the DA process, risk management permits companies to anticipate potential impacts to, and consequences of, their actions for input to planning and decision-making endeavors.

Becoming proficient in decision analysis and risk management first requires an understanding of the elements of decision quality and their application to the DRM process. This encompasses understanding, and communicating, the components of a decision and measuring the degree to which each component is satisfied for a given decision.

October 25, 2018

To effectively participate in the DA/DQ process project teams should become competent in the application of proven toolsets and output insights. With that competence comes appreciation for the power of the analyses in providing insights for improving the quality of decisions made in the project portfolio.

Successful delivery of major investment projects is most likely when project teams and management commit resources only after utilizing best-in-class toolsets, linked together in a consistent, repeatable fashion. These suites of proven tools include, but are not limited to, classic risk analyses and risk management.

Project teams and management can become effective in these approaches given reasonable time, and after initial training/coaching. Given this foundation, competence is best achieved in a *learn-by doing* environment.

2. DEFINING DECISION SUPPORT PACKAGE REQUIREMENTS

2.1 Example details of DSPs

The following identifies four main sections that are generally included in a decision support package:

<p>1. Project Overview</p> <ul style="list-style-type: none"> ○ Current mission ○ Current goals ○ Strategic alignment ○ Project team recommendations 	<p>2. Business Case</p> <ul style="list-style-type: none"> ○ Cash flow ○ Budget ○ Marketing considerations ○ Risk-weighted economics ○ Goal alignment ○ Commercial viability ○ Deviations in original plan for this stage
<p>3. Decision & Risk Analyses</p> <ul style="list-style-type: none"> ○ Evaluation of alternatives ○ Key measures and metrics ○ Probabilistic risk analysis ○ Decision/sensitivity analysis ○ Health, safety, and environmental considerations ○ Recommendations and rationale 	<p>4. The Plan for Project Delivery</p> <ul style="list-style-type: none"> ○ Costs, schedule and resources for the next phase of the project ○ Deliverables for the next project phase ○ Decisions to be made during the next project phase ○ Required agreements

The team should also compile:

Reference Documentation

- The project plan
- Health, safety and environmental plan
- Cost estimates
- Project schedule
- Risk assessments
- Contract strategy

October 25, 2018

Typically, reference documentation that is used to support the executive summary is not distributed outside the immediate team. Among the DSP Deliverables listed in Figure 2.1, items highlighted emphasize how DA/DQ expertise is applicable across various sections of the DSP contents.

Example Decision Support Package Deliverables:			
Project Overview			
Business : Goal/Strategy/Objectives:	Key Result Areas (KRAs), Measures and	Statement of Requirements (SOR):	
Project : Goal/Strategy/Objectives:	Metrics:	Boundaries/Constraints:	
Stage: Goal/Strategy/Objectives:	Project Scope:	Related Projects	
Business Case Assessment			
Recommended Finance	Capital Efficiency	Key Business Risks and Mitigation Plan	Budgeted Amount \$m:
Memorandum Topics:	Discounted Payback	Key Financial Milestone Dates	Cash Flow:
Project Description	Economic Fundamentals	BU Track Record	Marketing Considerations:
Estimated Capital \$m (Net)	Sources Of Value	Full Cycle Economics	Commercial Viability:
Estimated Expense \$m	Cost Benchmarking	Specific Sensitivities	Risk Weighted Economics:
Overall Project Strategy	Maximised Value	Financing Strategy	Net Working Interest:
Economic Indicators	Total unit cost of supply	Accounting Format	Project Life:
NPV / % IRR	Net unit margin		
Decision and Risk Analysis:			
Internal and External Risks and Uncertainties:		Evaluation of Alternatives, Opportunities, Options:	
Probabilities, Impacts, Sensitivities, and Ability to Mitigate		Health, Safety, and Environment:	
Holistic Uncertainties (Opportunities and Risks)		Site Characteristics and Assessment:	
Plan for Project			
Estimated Capital and Expense \$m:	Cost/Schedule/Operability (Top Quartile Targets)	Plan for Next Stage	
Sum of Prior Stages	Others	Decisions to be Made:	
Remainder of Project	High Level Project Plan (including schedule of key milestone events)	Deliverables:	
Total Project Amount	VIP Plan:	Estimated Cost for Next Stage:	
Schedule and Resources Needed:	Change Management Plan:	Schedule and Resources Needed:	
Contracting Strategy:	Risks and Uncertainties Management	Facilities, Agreement, and Permits Required:	
Success Assessment:	Scope Management	Gatekeeper:	
FEL Index	Exit/Cancellation Impact and Alternate Strategy	Single Point Accountability:	
Team Integration	Asset Disposal, Dismantling or Decommissioning Strategy	Project Team Members:	
VIP Application		Assurance/Consultations:	
Take-up of New Technology			

Figure 2.1: Example DSP Deliverables

3. THE 1ST SECTION : HIGH LEVEL DA FRAMING FOR DSP

As projects progress through their project development to secure relative certainty of their ability to deliver return on investment, many companies utilize both a Front-End Loading (FEL) and a Stage-Gate process. Passing through investment decision gates requires assembly and presentation of a Decision Support Package. In addition to a Decision and Risk Management section, several other sections of the DSP require the application of decision quality and decision & risk management expertise. Processes described here are applicable vertically to suit projects of all scales. Additionally, they are applicable horizontally to provide benefit to all sections of the DSP (see example DSP Deliverables in Figure 2.1)

Many organizations and project teams have adopted Decision Analysis as a proven basis for developing rational thinking and providing recommendations in the face of uncertainty. Decision Support Packages are multi-faceted and can address many aspects of planned investment in capital assets.

This section illustrates how the underlying principles for developing Decision Support Packages must, in every case, ensure that the process and toolsets employed generates the *Right Thinking and Decision-Making* by the decision maker(s) and *Right Thinking and Actions* by the project team (as displayed in Figure 3.1), towards enabling a Funding Investment Decision at each *gates* in the FEL Stage-Gate process.

October 25, 2018

The following is structured such that layers of detail and insight build upon a foundation that ultimately develops the full DA scope and engagement flow introduced in Figure 3.1. This paper will address the following topics:

- Overall Decision Analyses Engagement Flow
- Defining Decision Support Package Requirements
- Decision Maker's Deliverable Requirements with respect to DQ
 - Targeted Levels of decision Impact and required level of precision
 - Scalability of DA Process
 - Modifications by FEL Stage (i.e. requisite deliverables, anticipated decisions, projected cost and duration of the next FEL stage)
 - Practice and Pitfalls
 - Expected Value and Cumulative Probability graphics (Referenced in the Section 2, but not covered in depth in this paper)
- Requisite Framing to Develop DA in support of the DSP
 - Stick Model – Theory, utility, application
 - Objective Hierarchy – Theory, utility, application
 - Frame Project / Business Priorities
 - Team Alignment – Decision Radar
- Classic Decision Analyses
 - Decision Classification (Hierarchy) – Methods, pitfalls and facilitator Guidance
 - Investment / Strategy Tables with related criteria “triggers” and assignments – Methods, pitfalls and facilitator Guidance
 - Influence Diagramming / Decision-Risk Tree development – Methods and facilitator guidance
 - Interpretation of Expected Value Curves – NPV / IRR% examples

3.1 Decision Analysis in the Front-End Loading (FEL) Process

Front End Loading is arguably the single most important process in the capital project life cycle. Known by many terms such as pre-project planning, front end planning, sanctioning process, and others, FEL creates the critical underpinning to any capital project. It is focused on creating a strong, early link between the business or mission need, project strategy, scope, cost, and schedule; and maintaining that link unbroken throughout the project life. Front End Loading has been considered an industry Best Practice for many years.

The methodology typically uses a stage-and-gate process, whereby a project must pass through formal gates at well-defined milestones within the project's lifecycle before receiving funding to proceed to the next stage of work. Funding decisions at these gates are based upon appropriate Decision Support Packages being submitted. FEL is often used by industries with high capital-intensive projects, however the methodology is completely scalable also applies well to smaller projects. The Stage-Gate Investment Process draws the project model as a series of Stages –groups of related activities, separated by gates – specific decision points for funding the next stage and continuing to invest in the project.

At each gate, the project team presents management with a Decision Support Package, a systematically developed volume of information with which to evaluate the project and determine its future (see for example Figure 3.3, Systematic Development of DSPs by Project Stage Gate). The process permits plans and commitments to be made in such a way that optimizes an organization's overall return on investment.

In Figure 3.2, the reader will notice the project team may be requested to rework the DSP, working through the circular path shown more than once until the decision maker(s) chooses to fund the next Stage of FEL project development. A rigorous and scalable process must be able to respond to unexpected, but necessary changes.

October 25, 2018

Effective FEL significantly reduces capital expenditure, reduces rework, reduces the risk of cost overrun, and improves project return on investment. Therefore, it is extremely important that both the time and the cost of scheduled workshops and participants for FEL are included in the overall project budget and schedule. In Figure 3.2, the Assess, Choice, and Design stages are also known as FEL 1, FEL 2, and FEL 3 respectively.

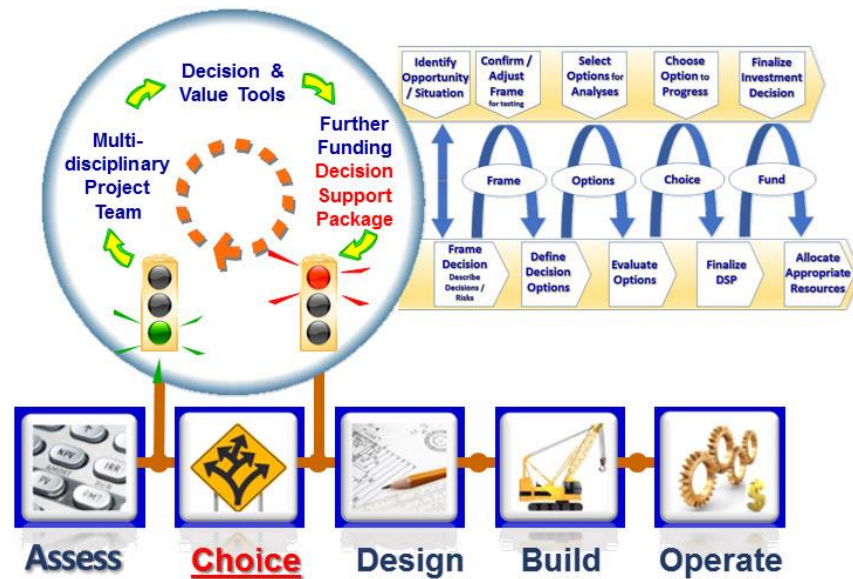


Figure 3.2 : Example Systematic Development of DSPs by Project Stage Gate

The decision process interaction commits project teams and decision makers to mutually determine the content and quantity of information needed for the DSP. Each stage concludes with the presentation of the DSP at the decision gate. Classic and proven decision analysis tools and methodology are combined throughout this dynamic interaction to improve the quality of decision-making.

3.2 Decision Support Package Overview / Example

The classic Decision Support Package is a compilation of key project information used to frame business decisions. Teams use the DSP as a decision-making support tool to determine the insights on a project’s viability for further capital investment. Emphasis is placed on potential threats and opportunities. The DSP documents the team’s recommendation for the project at each FEL stage gate decision. FEL stipulates that a project should not progress through one gate to the next stage until the gatekeeper has agreed that all key deliverables required by a particular gate have been sufficiently addressed; and the DSP is submitted to and approval granted by the appropriate decision makers.

Example “DSP” Executive Summary contents :



Figure 3.3 : Typical DSP Contents

The DSP is also a communication tool used in engaging the decision maker/gatekeeper to:

- Define project boundaries within which the team operates
- Provide information on changes to underlying business conditions
- Communicate findings and recommendations

3.2.1 Generic DSP Contents

The DSP is a significant tool to aid effective decision making. The DSP describes elements in the analysis of decision alternatives and choices, as well as the goals and objectives that guide decision-making (see for example, Section 3.3.1.1 will describe the development of a Statement of Requirements). Key issues will address a decision-maker's preference regarding alternatives, criteria for choice, and choice modes, together with the appropriate or preferred risk assessment tools and the rigor of analyses required.

By clearly defining the level of information the gatekeeper needs, the team will avoid collecting too much detailed information too early in the project. For example, in the Assess stage (FEL 1) the team should not develop a definitive detailed project schedule. The cost associated with compiling a definitive full project schedule in Assess is not justified.

At the beginning of each FEL Stage, the project team determines DSP requirements by addressing questions such as:

- Are business and project goals, strategies, and objectives still aligned?
- What is the decision to be made at the end of this stage?
- Who will provide Assurance for this stage?
- Who is the Gatekeeper for this stage?
- What project alternatives (Opportunities or options) to consider?
- What information (and level of detail) is needed to make a decision?
- Who will provide information? What is each person's role?
- What is the impact and strategy if project is canceled at this stage? (proactively identify an exit / cancellation strategy for each stage)

3.3 Overall Decision Analysis (DA) Engagement Flow

Decision Analysis is the discipline comprising the philosophy, theory, methodology, and professional practice necessary to address important decisions in a formal manner. The term, Decision Analysis, was coined in 1964 by Dr. Ronald A. Howard [1], who since then, as a professor at Stanford University, has been instrumental in developing much of the practice and professional application of DA.

Decision analysis includes many procedures, methods, and tools for identifying, clearly representing, and formally assessing the important aspects of a decision situation; for prescribing the recommended course of action by applying the maximum expected utility action axiom to a well-formed representation of the decision, and for translating the formal representation of a decision and its corresponding recommendation into insight for the decision maker and other stakeholders.

The overall flow of a decision analysis engagement is based upon the requirements of the project/investment decision. For project teams, decision analysis and risk management will be an iterative process, building on information that has been gathered in previous project stages or contained in previous DSPs. A systematic, interactive relationship between decision makers and the project team ensures good quality results and fosters a commitment to action.

Referring to the decision analysis scope and engagement flow shown in Figure 3.1, note that the top line depicts decision makers. Within this paper, we shall define decision makers as a group of individuals (or their delegates) without whose approval a project cannot move forward. The bottom line of Figure 3.1 shows the multi-discipline project team. As the two groups interact, they move towards a collective decision, i.e. a decision to continue funding the project or not.

In addition to making funding decision, the role of the decision maker(s) includes:

- Commitment to be an active participant in the agreed-upon communication method
- Ensure an open, honest and risk-free environment for communication
- Support the decision analysis process
- Approve the frame, alternatives and information
- Provide values and trade-offs
- Make the decision
- Approve implementation plans
- Responsible for organization action and resource commitment

The following sections break-down the decision analysis scope and engagement flow graphic shown in Figure 3.1, building-up layers of detail to enable the reader to better appreciate the detail associated with each step leading to a final investment decision.

3.3.1 OPPORTUNITY

Prior to identification of potential opportunities to the project team, there normally will have been significant work conducted in developing corporate strategy, development of strategically aligned ideas and aligned opportunities by business development. Therefore, senior management will have already decided that there is justification to start the work of Front End Loading and development of a DSP, including decision quality.

3.3.1.1 Decision Maker(s) Opportunity Assignment (Identify and Describe the Opportunity)

The Statement of Requirements (SOR) is a formal document, used by decision makers to define in general terms of the initial project or investment opportunity. It can vary from being a one-page document that captures the initial opportunity discussion or a relatively simple project up to a sizeable document for projects in later project development stages that incorporate the *basis of design*, i.e. plant, equipment, pipe sizes, pressures etc.

The SOR is intended to document, in a clear and unambiguous manner, the key engineering inputs and the major engineering requirements and management tasks that must be completed to meet the defined business objective. The completed SOR is intended to identify the factors that the business sponsoring the project considers important to the ultimate success of the project, as well as being a high-level specification for the Decision Support Package.

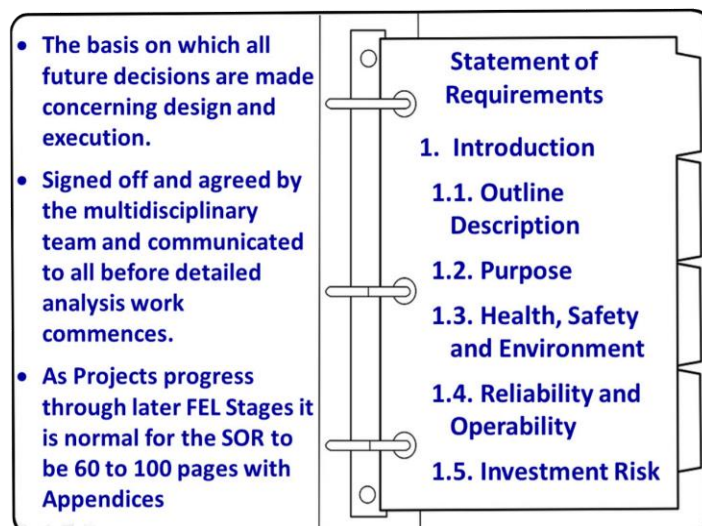


Figure 3.4 : SOR Contents / Purpose

In practice the SOR is usually prepared by the project personnel who liaise closely with the decision maker(s). It is important that the decision maker(s) formally approve the SOR as it establishes a contract between the decision maker(s) and the project team and defines high level deliverables and expectations. Similarly, because of its significance, a change management procedure should be established that will ensure all changes receive the necessary approval.

October 25, 2018

At every FEL Stage, the SOR will form an integral part of the end of stage DSP and the project should not continue into the next Stage until the ongoing SOR has been approved. Often teams choose to conduct a facilitated meeting to finalize the SOR prior to embarking to initiate the subsequent process step, Framing.

3.3.2 FRAME

After agreeing to a Statement of Requirements from the decision maker(s), the focus of the DA engagement section of the DSP shifts to Framing. This process step is split into two parts, first engaging the project team and subsequently the decision maker(s).

3.3.2.1 Project Team Framing Assignment (Frame the Decision(s) to be made)

Framing is the best time for stakeholders to constructively challenge the project basis and set the team up for delivery success. At this stage in the development cycle, crafting a series of framing conversations is undertaken to ensure that everyone has the same mental model. Ultimately, the project team is seeking to frame all applicable decisions and define all relevant risks.

The intention of the framing process step is to ensure that any discussion concerning a target of analysis is consistent. The project team needs to develop a clear distinction between the overall project objectives, the relationships between the various subproject groups, and the external influences which may influence project outcomes. At this stage, a facilitator may work with the project team to characterize and acknowledge boundaries, including the functional needs that exist in the project.

A successful framing event requires careful planning and significant pre-work. The project team should define stakeholder requirements for the business opportunity, translate them into measurable project objectives and rank the objectives per their relative importance to the business strategy. The goal is to ensure all stakeholders are in sync with the project team tasked with delivering the business results.

Additionally, the team should encourage discussion of multiple objectives, e.g. fundamental objectives and underlying means objectives. Defining the decisions and actions to achieve the objectives are also important.

Project team members are routinely challenged to choose between alternatives, each of which responds to an important business objective. Value is achieved by establishing a common understanding of which objectives take precedence over others in the event of such a clash. A classic example is *cost versus schedule*. For instance, is it more important

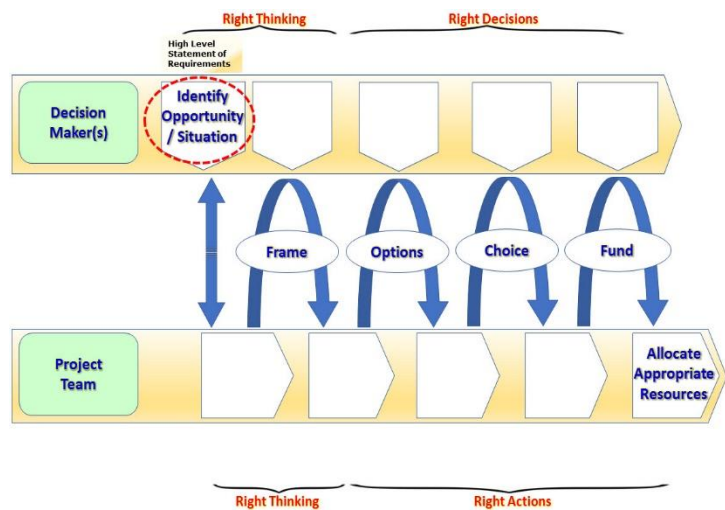


Figure 3.5: Decision Makers review the initial investment opportunity

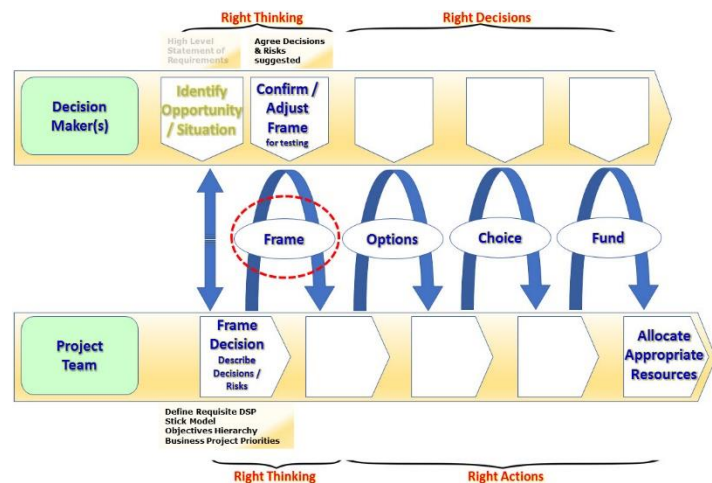


Figure 3.6 : Decision Framing steps performed by Decision Makers and Project Team members

October 25, 2018

to project success to complete on time, even if it results in a budget overrun? Alternatively, are the project economics so sensitive to capital cost that a reasonable delay is acceptable to avoid overspending the appropriation?

Finally, the project team should identify actions and analyses that must be conducted to facilitate decisions that could realize preferred objectives.

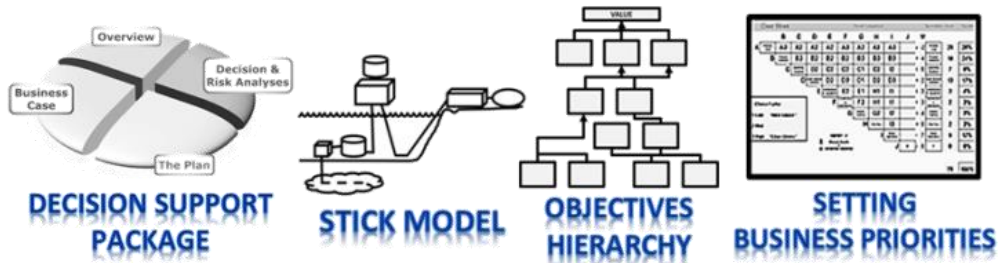


Figure 3.7 : Example Toolsets during Framing

Example Toolsets: Define Requisite DSP, Stick Model, Objectives Hierarchy, Business Project Priorities are expanded upon in the 2nd Section.

3.3.2.2 Decision Maker(s) Framing Assignment (Confirm / Adjust Frame)

This second phase of the framing process step requires the decision maker(s) to formally review the project team's initial framing of the business opportunity and project goals. As a by-product, they will identify potential decisions and risks, validating that they covered the subjects to be analyzed in order to compile the requisite DSP.

At this point in the process, it is often critical for the decision maker(s) to agree to the planned work of the project team in developing options and the rigor of analyses required of the team. The final output at this stage will be either confirmation or adjustment of the decision frame.

3.3.3 OPTIONS

After agreeing how the decision is to be framed and the level of effort required to produce a meaningful DSP, the focus of the DA engagement shifts to options. As before, this process step is split into two parts, first engaging the project team and subsequently the decision maker(s).

3.3.3.1 Project Team Options Assignment (Define Decision Options)

Using multi-discipline conversations, the project team is required to identify decision sets and define decision options recommended for formal analysis. This process step has significant ramifications since the outcome will drive the commitment of resources in a specific trajectory or development path and the consequences of such a commitment may prove impossible if not difficult to rework, modify or change. The theory and application are explained in detail in the 2nd Section - "Strategy Tables (Decision Sets with Strategy Themes)."

While developing the output required at this stage, the team is required to clarify options that support overall strategic investment themes. In other words, they must organize all decisions and potential sets of decisions in a manner that is aligned with the SOR or the agreed upon overall investment / project delivery strategy.

To aid the development of decision sets and investment strategy themes, tools employed at this stage typically include the development of a risk register and often an initial influence diagram.

Decision set options identified must be creative and doable, mutually exclusive, and compelling to analyze and cover the variety of decisions potentially available. In the investment theme/strategy table the team recognizes that decisions should be made in logical alignment with overall business strategic themes rather than made individually. Example potential themes are developed, and the aligned decisions noted.

A risk register is used to identify and elevate key uncertainty drivers that must be included in the analyses. A risk register developed for this purpose also serves as effective means to readily communicate risks within the project team and engage other stakeholders.

Additionally, by the considering how uncertainties can potentially impact results, stakeholders can determine where there may be gaps in existing data or knowledge and where additional information must be collected. Often generic risk checklists that have been assembled over time with previous projects are available to the project team to help identify risks that should be added to the risk register.

To minimize the potential for rework, the project team should clarify for decision maker(s) the contents and results that will be delivered from the decision and risk model.

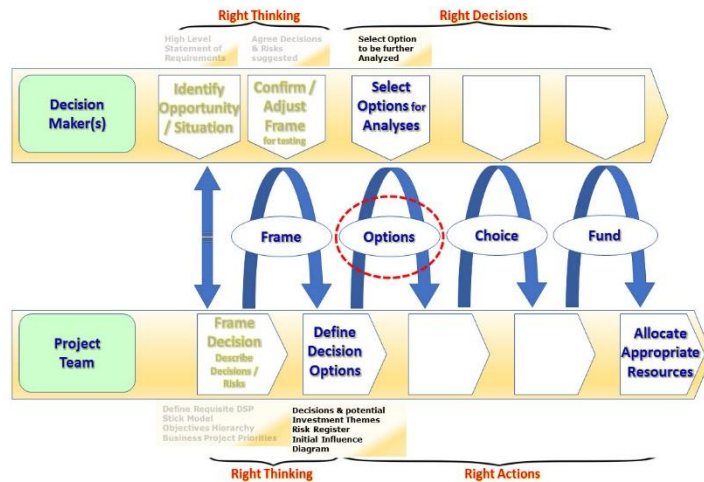


Figure 3.8 : Decision OPTION steps performed by Decision Makers and Project Team members



Figure 3.9 : Example Toolsets during the “Options” Process Step

Example Toolsets: Risk Register, Decision Sets, Strategy Themes, Initial Influence Diagram Priorities are expanded upon in 2nd Section.

3.3.3.2 Decision Makers Options Assignment (Select the Options to be Analyzed)

Decision maker(s) review the decision sets and/or decision options and direct the project team in terms of which strategic themes to ignore, which to analyze further or guide them toward an alternative hybrid strategic theme for analysis and, potentially, funding approval.

3.3.4 CHOICE

October 25, 2018

At this stage in the DSP development process, decision makers have selected the options to be evaluated further by the project team and, based on their recommendations, will choose an option or options for rigorous analysis.

3.3.4.1 Project Team Choice Assignment (Evaluate Options)

The project team conducts the work of options evaluation, which have been targeted by the decision maker(s) in the previous option selection meeting.

When evaluating options, the project team conducts in-depth analyses of the single or multiple decision sets selected by the decision maker(s) and arranged in investment/strategic themes. Occasionally, when progressing from the options step to the choice step, the decision maker(s) may opt to construct a hybrid set of potential decisions sets and strategies to test. The project team will have confirmed the rigor of analyses required and will construct the requisite final decision model to support the level of insights to be presented in the DSP submission. In this in-depth analyses the project team will produce graphics and model output to support the recommended investment decision set (strategy theme), with respect to continue / or not to fund the project to progress to the next FEL Stage.

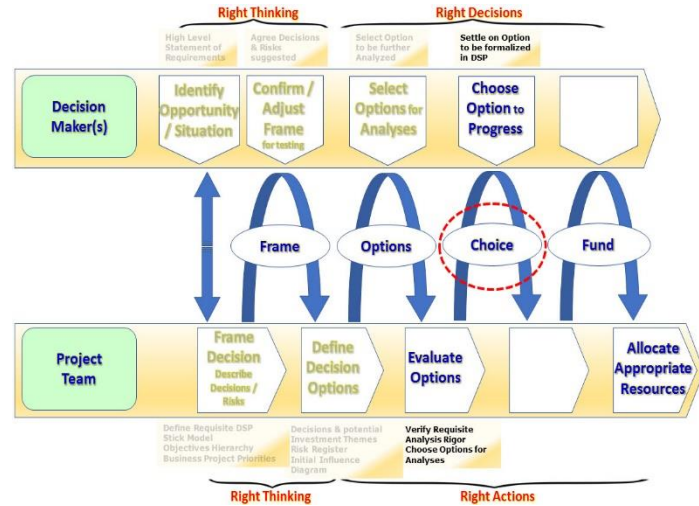


Figure 3.10 : Decision CHOICE steps performed by Decision Makers and Project Team members



Figure 3.11 : Example Toolsets during the "Choice" Process Step

Example toolsets during the choice step include: Influence diagram and strategy table input to the decision model, mitigation actions included in the risk register, output from the decision model including but not limited to tornado diagrams and cumulative probability curves of expected value, and the decision support package to be populated.

3.3.4.2 Decision Makers Choice Assignment (Select Option to be recommended in the final DSP)

The decision maker(s) ensures the level of analyses and rigor is commensurate with the DSP requirements and authorizes the project team to prepare the final complete DSP for the ongoing funding decision.

3.3.5 FUND

Since the decision maker(s) will have now selected, from the options/choice DSP, the final choice of investment themes to progress and finalize, the project team develops all the appropriate details to finalize the sections of the decision support package.

3.3.5.1 Project Team Funding Assignment (Compile DSP)

The project team finalizes cost and schedule projections for the project including a detailed resource loaded schedule for the next FEL stage to be approved by the decision maker(s). Additionally, the project team finalizes the DRM analyses which has been applied to other sections of the DSP. The project team then compiles and completes all sections of the DSP including the results of the DQ analyses in the decision and risk DSP section.



Figure 3.12 : Example Toolsets during the "Fund" Process Step

Example toolsets during the fund step include: Classic cost and schedule estimates and risk analyses, and organization mapping to support resource loaded schedule development.

3.3.5.2 Decision Makers Funding Assignment

Funding is the process step during which decision maker(s), along with other requisite departments of the organization or company, review the rationale for funding the project through the next FEL Stage. This should encompass all activities included in the DSP for the upcoming FEL or project lifecycle stage.

If it is decided that the project is to be pursued, the project is funded for the next FEL Stage and authorized to pass through the current stage gate. Alternatively, the decision maker(s) may decide to cancel or reassess the opportunity. There should be no surprises at this point since the decision support package requirements will have been communicated and validated during the earlier framing process step.

Note that gates are not merely project review points, status reports, or information updates. Stage gates are crucial decision meetings, where the critical funding and strategic prioritization decisions are made.

DSPs must have clear criteria so that senior managers can make fund/defer/reject and prioritization decisions objectively. Thus, stage gates become the ultimate check points in the capital investment process, delivering effective controls that ensure the right projects are progressed and delivered properly.

3.3.6 ALLOCATE RESOURCES

After a decision to fund and progress the project has been made, the project team will now allocate the appropriate resources to execute approved activities.

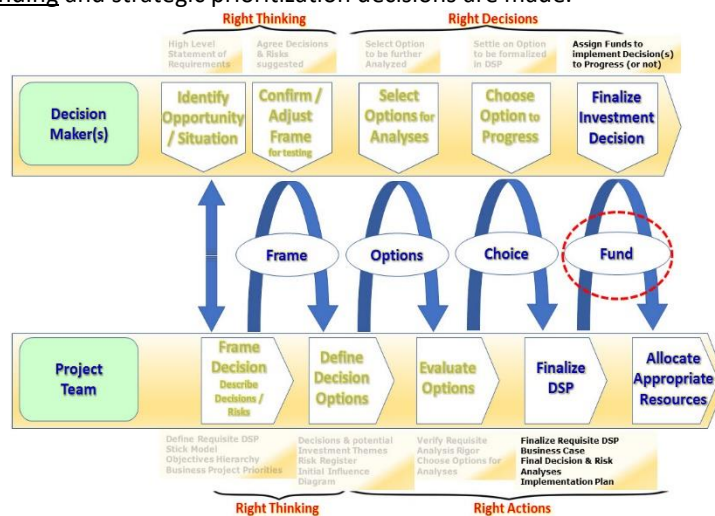


Figure 3.13 : Decision FUNDING steps performed by Decision Makers and Project Team members

October 25, 2018

3.3.6.1 Project Team Resource Allocation Assignment

As described in 2.1, the DSP will have been populated with the resource-loaded schedule for the next FEL stage. The project team executes the plan and schedules all activities approved in the funding to the next lifecycle stage.

FEL decisions resulting from DSP review may take one of four choices:

1. Fund ongoing support for the next FEL stage
2. Withhold ongoing support for the next FEL stage and *kill* the project
3. Place the project on hold for potential future review and/or implementation
4. Call for the project DSP to be reworked since the corporate strategic imperatives, the goals of the SOR or perhaps the project boundaries have changed

3.4 Overall Decision Analyses (DA) application Notes

3.4.1 Scalable DSP Content

DSPs and overall DA process are used, modified and scalable concepts for various project decisions. Essentially, during the final stage of the DA process, the completed DSP provides the basis of the decision data carried to the decision maker(s) or gate keeper.

The focus of decisions and therefore DSPs change and evolve for various reasons as project or investments opportunities progress. As the project team works through each of the FEL stages (FEL 1 = Assess, FEL 2 = Choice, FEL 3 = Design), the DA process contributes to DSP preparation and subsequent recommendations concerning the case for continued funding. While they are more often used on major projects, these methods and philosophies are equally applicable and scalable to relatively small project discussions or capital investments in general.

An example of project team focus in a complete 7 Stage project development process follows Figure 3.14 :



Figure 3.14 : Typical 7 Stage FEL Process

1. **Strategy Stage:** Considers strategic options; strategies; defines analyses: and funds strategy implementation and ideas generation.
2. **Ideas Stage:** Considers investment and revenue opportunities; develops high level view of the potential opportunity; ensures idea focus is aligned with strategy; and estimates the cost to assess potential return on investment.
3. **Assess Stage:** Develops an accurate picture of potential markets; begins projections of cost and potential return on investment; and begins initial asset development planning, including developing estimates of the cost to choose the best development alternative.
4. **Choice Stage:** Implements a market analysis program; develops alternative scenarios based on estimates of capital cost, operating cost, revenue projections and uncertainties; chooses the best development alternative for further investment; and estimates the cost to conduct the design stage.
5. **Design Stage:** Prepares detailed (build-level) cost & schedule estimates; begins full-scale project planning; completes bid level design engineering; and finalizes the funding estimate for the investment.
6. **Build Stage:** Completes detailed engineering for facilities construction; implements the full-scale construction program; commissions the facility; and turns over the facility to operations.

October 25, 2018

7. **Operate Stage:** Operates the asset to highest return on investment; appraises the project to assess investment performance; and contributes *lessons learned* to other asset development teams and to senior management.

3.4.2 Decision Quality Applicability

How do we know when there is an opportunity to apply DQ methods? Typically, organizations that embrace the tenets of DQ tend to be more effective at responding quickly to requisite changes in the business and project delivery environment and to changes in project delivery focus for results.

The checklist shown in Figure 3.15 is a reasonable “quick guide” to ascertain potential DQ applicability.

It is possible that some projects are not necessarily the sum of the decisions made. Traditional project management techniques are often designed to constrain project management into a regimented series of decisions and execution activities. Some projects (organizations) are not amenable to traditional project management. This discussion is usually a multi-tier affair.

ALL creative alternatives are not necessarily candidates for analyses.

Alternatives need to be

- *Reasonable* in the early framing conversation,
- Likely to be *viable* in later framing deliberations and
- *Compelling* to be analyzed at the final approved-for-execution contract.

DA/DQ Checklist to consider :

- Is this a “non-routine,” major decision?**
- Will this decision allocate resources which cannot be reversed?**
- Are there several potentially compelling alternatives to consider?**
- Is the potential impact of the decision (or decision set) significant?**
- Is this decision analytically and/or managerially complex?**
- Is there uncertainty associated with the decision consequences?**
- Will the decision to be assessed be implemented?**
- Is there time available to assess the potential decision rationally?**
- Is there significant value in engaging in a formal decision process?**

**If most of the answers apply
then a formal DA/DQ process will probably add value.**

Figure 3.15 : DQ Applicability Checklist

All three terms must be in alignment with the business mission, vision, and strategies.

Decision quality analyses cannot be delivered unless the decision maker(s) fund the team engagement to conduct the work.

Further, it is critical that the decision maker(s) are an active participant in the DQ engagement rather than passively waiting for analysis to appear.

October 25, 2018

4. THE 2ND SECTION EXAMPLE APPLICABLE TOOLSETS FOR TEAMS

4.1 Stick Model

A detailed overview of some example toolsets and methodologies referenced in each step in 1st Section “High level DA Framing” as applied for Decision Analysis / Decision Quality (DA / DQ) in DSP development. Some of these examples and their utilization date from the mid 1960s, others have been added and augmented since then. However, all of the example toolsets shown have been used extensively by hundreds of project teams and management worldwide for well over 2 decades

4.2 Stick Model

At the beginning of any framing effort, it is critical to ensure that everyone has the same mental model. One of the most effective tools to ensure everyone is talking about the same project is to create a stick model.

A stick model is a stylized sequence of simple geometric shapes and figures used to identify and characterize the boundaries and the functional needs that exist in the project, as best understood by the team (see Figure 4.1).

Care must be taken to ensure that the least amount of bias is built into the model. For example, simple geometric shapes should not look like project components. The shapes are simply indicative of *functional needs*. Although the stick models should be initially drawn with a minimum of detail, the model must evolve into more detailed description.

Some teams will initiate an issues list during early project framing efforts. These issues may be listed and documented in a manner similar to a risk register. The issues represent work to be done that resolves questions (technologies, data, organization relationships, etc.) and helps define decisions that need to be made.

The framing workshop is an excellent opportunity to collect and organize issues. The stick model serves as a good vehicle to develop decisions, uncertainties, interfaces and relationships, grounding the project team in the conversation of framing. Teams initiate the capture of issues for resolution by using yellow sticky notes applied to relevant aspects of the stick model (see Figure 4.2).

Over many workshops, the boundary discussion evolved to have three types of boundaries:

- **Absolute boundaries** – uncontestable, the decision has been made. No Changes allowed. Curiously, even absolute boundaries can be challenged, as Management does not know everything. However, most absolute boundaries are reasonable and make business sense.

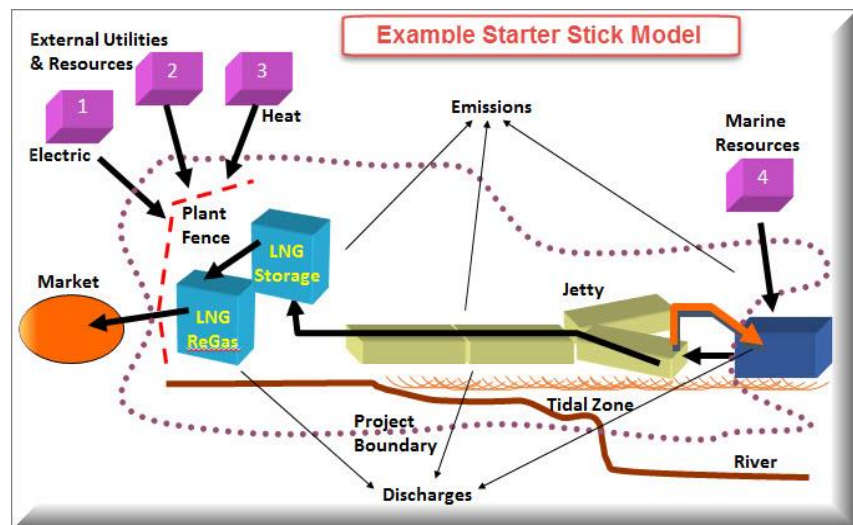


Figure 4.1 : Example “Starter” Stick Model

October 25, 2018

Challenges are usually not value added. Some absolute boundaries are based on moral, social, or personal biases

- **Malleable Boundaries** – for the current business understanding and environment, decisions and expectations have been “established” and should be honored. However, if reasonable value can be added, the project team has an obligation to confer with the decision maker to reevaluate the boundary. Some boundaries make sense until the business model changes
- **Ambiguous Boundaries** – Management and business model expectations are not always clear. Project ambiguity and uncertainty will impact boundary identification. These boundaries are captured and immediately discussed with the decision maker. If the decision maker is in the workshop, resolution may be quickly reached

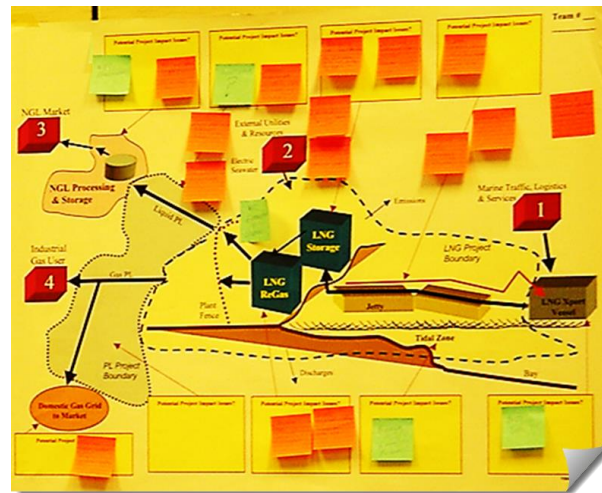


Figure 4.2 : – Stick Model with Issues captured in Workshop

4.3 Objectives Hierarchy

An Objectives Hierarchy is powerful way to ensure Business and Project Decisions support “Project Objectives,” align with Corporate Objectives and, ultimately, enhance Shareholder Value.

Objectives are illusive if the Project Team and Decision Makers have not agreed on the project objectives during the very early project stages. Value and risk trade-offs cannot be evaluated unless the project objectives are clearly stated and agreed. In simple terms, some project drivers are important and some are not. Stakeholders must have a common understanding around which project objectives will be used to characterize project success.

An Objectives Hierarchy is simply a graphical means to characterize what is important for the team to management (see for example Figure 4.3). However, it may also serve as a visual contract with Management, helping define expectations and project success. Further, it can be used to facilitate a discussion that reveals multiple / alternative Objectives, for example, which decisions if, “made well,” will deliver the Objectives and what Actions we must take to be able to make those Decisions

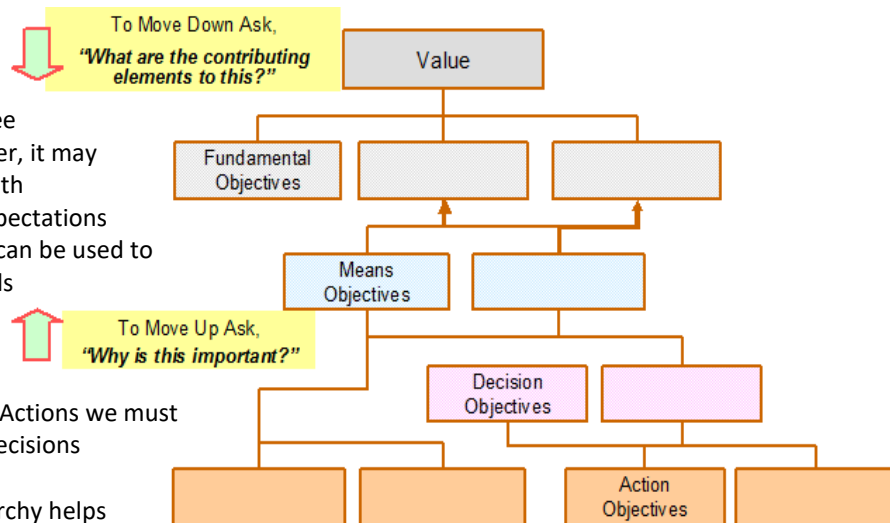


Figure 4.3 – Theory of Objectives Hierarchy

The Augmented Objective Hierarchy helps project teams prepare for discussions on trade-offs such as accelerating spending to improve schedule or enhance facility operability.

October 25, 2018

For example, if capital is scarce, the schedule or completion date may not be a fundamental project objective. However, if sufficient value can be realized by accelerating the project schedule, there may exist a strong case for an organization to make capital available. The objective hierarchy provides a dynamic negotiation tool for discussing project value, options, and risk.

Note: Often Project teams have difficult to clearly articulate “Fundamental Objectives.” Additionally, they tend to have trouble separating “Means Objectives” from “Decisions” and “Actions.”

Most teams cannot devise a traditional (i.e. Clements) objective hierarchy “from a blank page” during an actual workshop event. If a traditional objective hierarchy is needed, it should be constructed before the workshop and should not be distributed until the workshop. During the pre-work interviews, the hierarchy can be shown and modified. Having a workshop handout and poster(s) allows for a constructive discussion (see Figure 4.4 for example).

Also, project team members may not be concerned about an Objective Hierarchy. The tool is occasionally viewed as somewhat abstract and not recognized as impacting an engineer’s job and deliverables directly. The impact unfolds as required Actions are related to being able to make Decisions which can deliver the Objectives. The project management team, however, should immediately care about the Objectives Hierarchy conversation and recognize the tool utility and update the hierarchy as the project progresses.

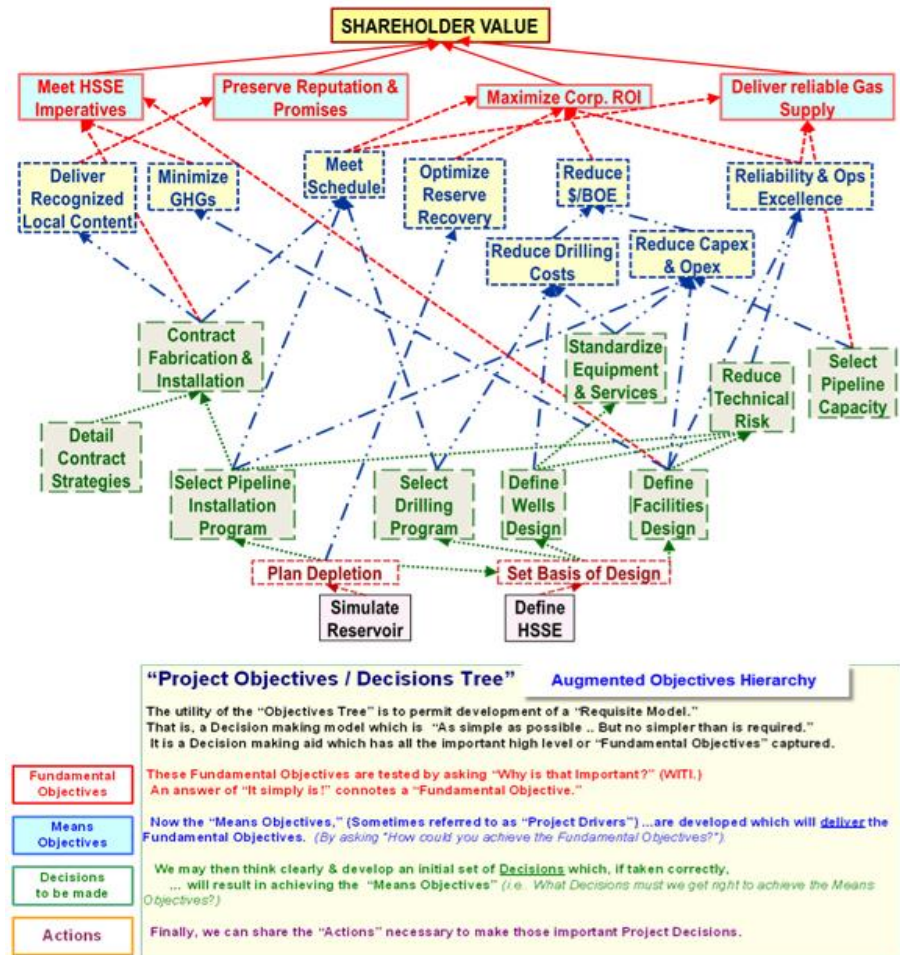


Figure 4.4 – Example “workshop starter”: Objectives Hierarchy

4.4 Business/Project Priorities VIP

Definition: Setting Business / Project Priorities (SBP) is a communication process that identifies the stakeholders' requirements and expectations for a business opportunity, translates them into measurable project objectives and ranks the objective according to their relative importance to the business strategy. It puts the stakeholders of the business opportunity in sync with the project team who can deliver the business results. It is an excellent precursor to Decision Analyses and decision options discussion.

- Identifying stakeholders and involving them in the process
- Developing a thorough understanding of the stakeholders' requirements and expectations
- Defining the mission of the project
- Achieving consensus as to relative importance of stakeholders' requirements and expectations
- Selecting and applying techniques to relate stakeholders' requirements and expectations to what the project team can deliver
- Maintaining continuous contact with stakeholders and keeping an open dialogue across FEL Project delivery stages

SBP is used to clarify the team focus as they progress the project to the next Stage Decision Point. It draws upon the concepts of the well-known Value Engineering "Pre-Event." However, it requires some facilitator skill when teasing out the Attributes of a Quality Decision within the early stages in the project. SBP is normally engaged in 4 sections, each of which build upon each other.

1. Clear Project vision: as developed by discussing & answering a short set of questions
2. Developing the Attributes of Value, or Key Results Areas, to be delivered and discussing the range of acceptability to management
3. Developing Consensus on the current "Snapshot" of the Project and / or Project plan
4. Prioritizing the teams' effort to improve the Project and / or Project plan

4.4.1 Definition and Applicability

Project team members are routinely challenged to choose between alternatives, each of which responds to an important business objective. The value in SBP is achieved by establishing a common understanding of which objectives take precedence over others in the event of such a clash. A classic example is cost versus schedule. Is it more important to project success to startup on time, even if it results in a budget overrun? Or, are the project economics so sensitive to capital cost that a reasonable delay is acceptable to avoid overspending the appropriation? Each project team member must understand the business implications of alternatives such as these in order to make daily decisions within his/her own job function that are consistent with those being made by other team members.

SBP is applicable to all projects regardless of size or complexity. The only issues relate to what extent the process should be formalized, discussion scaled, what tools and techniques should be used and what amount of time and resources must be invested to realize its intended benefits.

4.4.2 Who Should Be Using SBP

The target group for implementing SBP is certainly any project core team, and usually most of the extended teams. Although the project team is typically thought of as "using" this Value Improving Practice, the stakeholders also realize their objectives through successful execution of the project. Therefore, they should also consider themselves as users of the practice and participate fully in it.

Realistically then, anyone who is in a position to influence, or be influenced by the project should thoroughly understand the relative importance of the business reasons behind it and, thus, participate in the SBP discussion.

4.4.3 Who Performs the SBP VIP Functions?

Responsibility for capturing the value achievable by application of this practice lies with whoever has the leadership role in executing the project.

Larger Project Perspective. In the case of a large, complex project, a Project General Manager will be assigned who will sponsor SBP. Other team members would be responsible for participating in the process, providing input; and finally, for assuming ownership of the outcome.

Small Project Perspective. On smaller projects, this responsibility will fall to the Project Engineer or whomever is accountable for the outcome of the project. Again, all other team members are responsible for participating in the process and making it a meaningful decision-guiding tool.

Stakeholder Participation. Although the project team leadership drives implementation of the practice, it is not possible to overstate the importance of stakeholder involvement and active participation. The high-level benefits are:

- Enhanced appreciation of stakeholders' requirements and objectives
- Higher quality of Front End Loading to meet stakeholders' requirements
- Continuity of focus on stakeholders' requirements as the project progresses from one FEL stage to the next
- Consistency among individual team members' daily project execution decisions

4.4.4 Applying the SBP VIP to the FEL Stages

Setting Business Priorities (SBP) is a Front-End Loading process and is applicable to all the FEL stages. It will deliver significant value when entered into at the beginning of the FEL 1 and 2 Stages.

It is most used in FEL Stages 2 & 3 where its implementation guides the process of translating business objectives, which may be common to all of that Business Unit's projects, into project objectives which may be uniquely specific to the project at hand. When applied according to design, the SBP targets accomplishing Project goals in a manner that maintains focus on the business purpose of the project. In the Design/Define Stage (FEL 3), the key project objectives drive ultimate project scope definition and the development of a set of measures or KRAs (see figure 4.5 for example) to quantify how well project execution is targeted to achieve the business purpose.

Project Scores															
Value Attribute	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Availability						90				93					95
Capex						3265		2920							2700
Expandability						1							8		10
Opex						90				70					60
Project Schedule						2Q 2011						4Q 2010			3Q 2010
Legend:															
Maroon Values	Worst Acceptable Value														
Green Values	Best Acceptable Value														
Blue Values	Current Value														
Note:	When the color in column 1 is Blue, then the current value is the same as the Worst Acceptable Value, and when color in column 10 is blue then the current value is the same as the Best Acceptable Value.														

Figure 4.5 – Sample Attributes of Value or Key Results Areas (KRAs) at FEL Stage 2

October 25, 2018

4.5 Decision Radar Exercise

The Decision Radar Exercise is an individual input exercise, rather than a “team consensus” group exercise. However, the group observes significant insights from the results of the exercise. This tool does not replace toolsets that should be used to engage the team prior to DQ framing, such as a Stick Model, an Objectives Hierarchy, and (importantly) Setting Project/Business Priorities.

DA Team Alignment

Descriptions on the Decision Quality chain are found in academia and are public knowledge (see figure 4.6). Here the analogy is simply that the quality of a decision is only as good as the weakest link. The Dr. Ron Howard (Stanford University) version is largely the same: Helpful Frame, Creative, Doable



Figure 4.6 – Decision Quality Chain Links

Alternatives, and Meaningful, Reliable Information Clear Values & Trade-offs, Logically, Correct Reasoning, Commitment to Action Making the six elements relate to the team is important for framing the project within a business context, Figure 4.7. This tool does not replace toolsets that should be used to engage the team prior to DQ framing, such as a Stick Model, an Objectives Hierarchy and (importantly) Setting Project/Business Priorities. Rather it informs the Project team of different perspectives held by team individual members with respect to the decisions to be made/analyzed.

It is simply a quick team response tool which gives team members an appreciation of how they currently think differently about various aspects of a Quality Decision, and how close the team is to making a recommendation. Using the Decision Radar tool, The Project Team shares individual perceptions of how much more the team must do on each Decision Radar Arm to deliver a decision recommendation (see Figure 4.8).

The Project team reflects upon the graphic developed, with a goal to examine the reasons for the differences in individual perceptions, and pursue resolution of any apparent conflicts uncovered.

Framing the problem or decision	Ensures that we address the right problem; identify what is within the scope of the decision and what is outside the scope
Creative, doable alternatives	Ensures a real set of alternatives that are creative, significantly different and doable— offering decision makers some real choice
Meaningful, reliable information	Correctly and effectively defines what we know and don't know; information combines data (facts) and the judgments we make about the future
Clear values and trade-offs	Establishes a common understanding of the value measures being used to evaluate alternatives
Logically correct reasoning	Integrates the above elements— alternatives, information and values—and drives an understanding of all possible consequences for each alternative
Commitment to Action	Motivates decision makers by involving them throughout the process to ensure the decision includes a commitment to implement the strategy

Figure 4.7 – Example Decision Radar Arms

Interpreting and Learnings

Often only the average value for each element is shown on the six-legged star (see Figure 4.8). If all the team responses are shown, it is very easy to see how diverse views can be. This information is very powerful for informing FEL, FEED and value management conversations.

4.6 Decision Classification

At each defined “Phase of the Investment,” Project decisions are discussed, and it is very useful to take the time to “classify” these decisions. Specifically, those that are to be analyzed to deliver recommendations to Management at the next “Funding Request Gate,” must be uncovered and clearly described.

The classification is as follows:

- Established project Policy (Classification: **Given**),
- To be considered by the Project team now (Classification: Team **Focus** on analyses of the current Project Stage to make a continuous Investment Recommendation)
- Should be left until later when the appropriate Funding has been agreed (Classification: **Tactical** for the Project Team)

Using this “Decision Classification” enhances discussion of policy and strategic decisions between Management and the Project Team (see figure A-10 for example). This early project discussion between Management and the Project Team is used to prioritize the decisions that need to be considered immediately aside from the decisions that can wait. In short, what decisions must be made in the current FEL Stage and how can resources be used to clarify the decision values, options and risks.

“Given” Decisions are: Made by “Management” and are generally integrated into the corporate culture. Safety and Reputation issues are often erroneously characterized in policy decisions; however, these are not decisions and are in fact Objectives which should be addressed as Fundamental Objectives in the Objectives Hierarchy. Decisions are made which are most likely to deliver these Fundamental Objectives related to Safety and Reputation outcomes. *An important concept to remember is that one cannot “decide” outcomes; one can only make decisions which may result in sought after outcomes happening.*

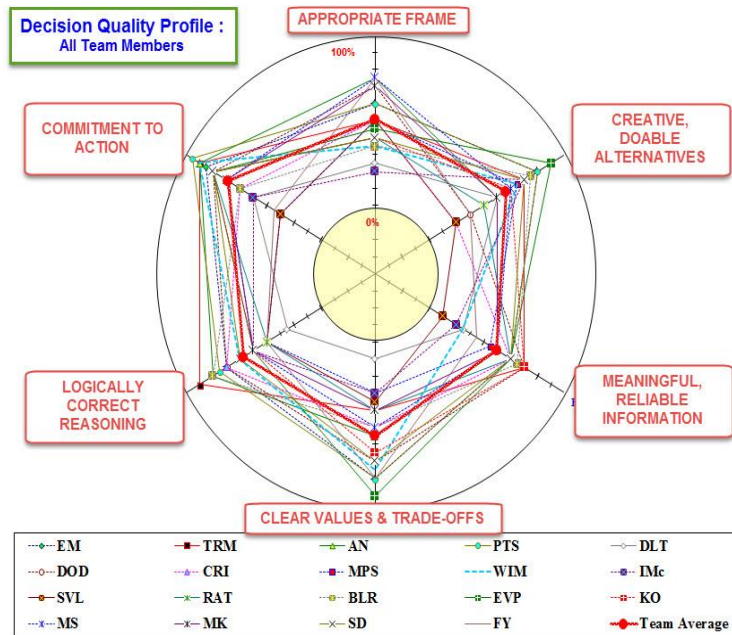


Figure 4.8 – Decision Radar highlighting an array of different team member opinions

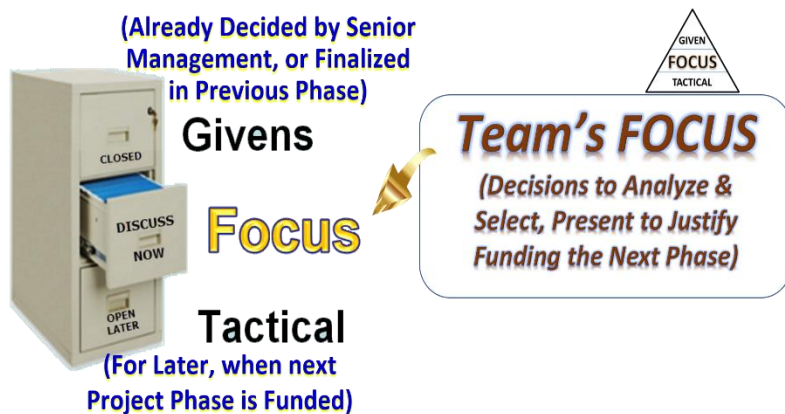


Figure 4.9 Decision Classification

October 25, 2018

There are decisions which will be regarded as “Given or Policy” to the Project Teams since they have been analyzed in a previous Asset / Project Investment Phase, agreed to in the Funding Decision Review and should not be revisited by the Project Team. For example: to build a plant in a specific location, to install a modification during a turn-around or to use in-house power generation rather than local utilities.

In certain instances, corporate cultures have very specific approaches and/or specifications to achieve company objectives and may never wish to alter the approach.

Project teams are rarely permitted to make / change policy. However, the Project Team can use the Classification to test Management policies and to evaluate the impact that stated policy will have on project objectives. It is routine for the decision Classification debate to reveal some Management latitude regarding policy if the alternatives are reasonable and do not downgrade safety and reputation.

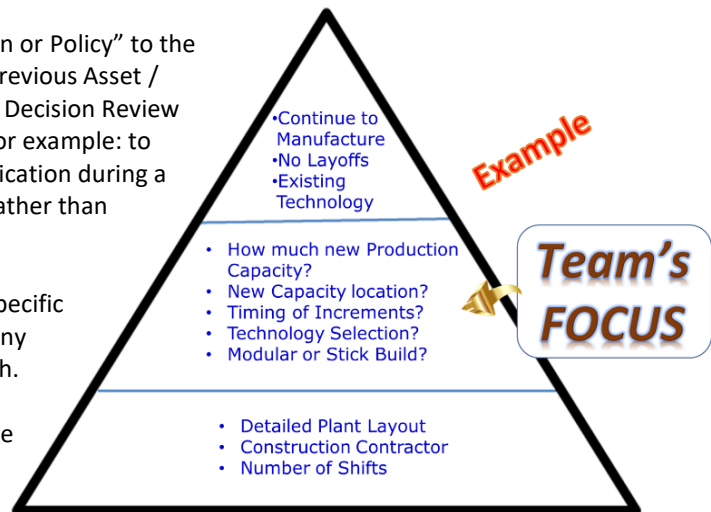


Figure 4.10 – Example Decision Classification Discussion

Any outstanding Policy/Strategy decisions must be made in the immediate future or the project objectives will be impacted. The Project Team is generally responsible to make recommendations on Decisions within the boundaries set by Management, or to propose viable alternatives for a Management decision.

Team Focus Decisions are those which are compelling to analyze so as to be able to recommend a course of action to pursue which warrants further investment in the Capital Project. (Or to recommend withholding funding and kill the Project)

Tactical Decisions can be *deferred* and will not impact the project objectives. For examples, during the early project stages, the paint manufacturer is usually not important and can be deferred until later. Tactical decisions should be captured as issues to be resolved and should be entered into an “issues register” for future handling.

4.7 Strategy Tables (Decision Sets with Strategy Themes)

The Decision Classification discussion will be used to generate a Decision Set Table (see Figure 4.11 for example). The Decision Set table is simply a matrix that lists the potential Investment decisions and the alternatives (options) about the decision. Every major decision should be captured in the Decision Set Table. If the table begins to be unwieldy, the Decision Sets should be divided into “high level,” and “low level,” decisions or some similar approach that makes the matrix and ensuing analyses manageable.

Once the Decision Set Table is built, the Project Team can devise various project Investment Themes or “future state outcomes” (see for example Figure 4.12). Investment Themes should be characterized using Simple Titles such as:

- “Capture Total Infrastructure” (e.g. high capital investment in an emerging market)
- “Low cost / minimum CAPEX” (e.g. Minimum capital cost exposure some potential risks may be accepted)
- “Green Solution” (e.g. Primary focus is on environmental awareness and sustainable operations rather than ROI)
- “Earliest Production” (e.g. fastest product to market even if lower long-term ROI)

October 25, 2018

The number and nature of the potential investment themes are only limited by the imagination of the Project Team. However, generally 4 to 6 encompasses the rational field of clearly different investment themes. After sufficient themes are created, and explanations of the specific differences in the themes documented, each of the decisions columns are examined and the appropriate option is selected that would allow the theme to best succeed.

For each investment theme, only one option can be selected for each decision. The resulting “String of Decisions” should make the “Investment Theme Aligned - Decision Set” both viable & compelling to analyze.

We refer to this approach in alignment of options of rational Decision Sets as “**Threading the Investment Themes.**”

It is important the Team understands that the sets of Decisions are tested as a linked set. In most projects, if not all, opportunities, and investments Decisions are not taken as “stand alone,” but rather in logically aligned sets based on an overall agreed upon investment strategy.

Decision Modeling

As the Decision Set Table is populated with decision areas, options, and investment themes, some options will be selected repeatedly for several Investment Themes. The Project Team should pay particular attention to those options. There is a high likelihood that the viable, robust and compelling solutions will contain those options as part of the decisions made. As such, the Project Team should determine if the option really requires additional evaluation and if so, what resources are needed.

Reservoir Pressure Maintenance	Number of Drill-sites	Development Options	Flexibility to Process	Host Facility Options
Gas Injection Only	Single Drill Site	Dry Trees Only	Tight Design to Capacity (Fit for purpose)	TLP / SPAR / TPG3300
Water Injection Only	Multiple Drill Sites	Wet Trees Only	Build for Expansion (Equity)	FPSO
Combination Gas & Water Injection		Combination of Dry Trees and Wet Trees	Build for Future Growth (Reservoir Upside)	Semi-Submersible
Natural Depletion				Sub-Sea Tie-Back to Host Facility

Figure 4.11 – Example Decision Set Table

Investment Themes (Potential Strategies)	Reservoir Pressure Maintenance	Number of Drill-sites	Development Options	Flexibility to Process	Host Facility Options
Capture Total Infrastructure	Gas Injection Only	Single Drill Site	Dry Trees Only	Tight Design to Capacity (Fit for purpose)	TLP / SPAR / TPG3300
Low Cost / Minimum CAPEX	Water Injection Only	Multiple Drill Sites	Wet Trees Only	Build for Expansion (Equity)	FPSO
Green Solution	Combination Gas & Water Injection		Combination of Dry Trees and Wet Trees	Build for Future Growth (Reservoir Upside)	Semi-Submersible
Earliest Production	Natural Depletion				Sub-Sea Tie-Back to Host Facility

Figure 4.12 – Example Strategy Table

October 25, 2018

In many cases, various themes will compete and will represent different values and risk. In these circumstances, formal decision analysis software, and modeling, should be used to model the theme(s) to assess how the project objectives are impacted by the perceived risk and uncertainty.

Typical DA tools available include deterministic models (e.g. spreadsheets), decision trees, influence diagrams, and tornado / cumulative probability charts giving insights as to potential spectra of Return on the Capital Investment. Usually projects have significant uncertainty and ambiguity and probabilistic modeling is used to provide valuable insight about the range of decision outcomes. The DA models help to prioritize the decisions and risks that have the greatest impact the project objectives. In discussing Decision Sets to be included in the Decision Set / Strategy Table the Project Team will find is useful to consider:

What is a Decision?

A decision is a choice among several different possible courses of action. Is more than one possible and reasonable choice available? If not, there is no decision to be made. Keep in mind, however, that it is not always apparent that alternatives exist, and a key part of discussion is to discover alternatives.

- Viable and doable (no science fiction)
- Mutually exclusive (from other choices)
- Includes all possible choices (no cherry picking or bias)
- Compelling to analyze (“Yes, this choice is interesting”)

What resources will be irreversibly allocated?

A decision is generally an allocation of resources such as Capital, Reputation related Commitments or Personnel. If the decision does not entail an allocation of resources, there is probably no true decision at hand.

If considerable resources are to be allocated in the decision, it probably ought to be tested by modeling the potential impact of a “wrong” decision. If the amount of resources is small, the appropriateness of whether to pursue analyses will depend on other factors.

Take care in answering this question; some very high-level decisions set policy for many lower level decisions, and the true allocation of resources may not be readily apparent at the high level.

How great is the impact?

A decision is an allocation of resources to achieve some end that has an effect. How great will the impact of this decision be on the organization? If it is large, it probably would be appropriate include the decision in the Analyses. If the impact is slight, the appropriateness of whether to pursue analyses will depend on other factors. To gauge the possible impact, consider the following questions:

- What is the best that could happen as a result of this decision?
- What is the worst that could happen as a result of this decision? (Remembering that a lost opportunity is also a bad outcome.)

If the probability is high that the decision could have a large good or bad outcome, inclusion in the Decision table for Analyses may well be warranted.

There is an important and often overlooked advantage to analysis of the Strategy Table or Investment Theme Table. A review conversation with the Decision-Maker can:

- Identify choices (decisions) that are never selected for any themes. These choices may not warrant further analysis and can be deleted as decision alternatives

October 25, 2018

- Identify choices (decisions) that are always selected for any themes. The single choices need to be carefully analyzed to ensure the consequences are fully understood. If appropriate, the single choices could be finalized as the only compelling decision choices.

Risk Description <small>*There is a risk that ___#1___ can happen due to ___#2___ resulting in ___#3___</small>	Risk Category	Owner accountable: <small>- to monitor and prevent risk realization - to suppress, reduce, attenuate risk consequences</small>	Manager Responsible for risk definition, mitigation and resulting consequences	Targeted Risk/Mitigation Closure Date	Current Risk Descriptors			Primary (first) mitigation measures put in place to manage consequences?	Most-Likely Financial impact without mitigation \$K (000)	Current Status	Risk Descriptors after primary mitigation		
					Impact	Probability	Weighted Exposure				Impact	Probability	Weighted Exposure
Description 1	(S / C)	Owner C	Manager A	1-Mar-10	Low	Med	2	Measure 1	\$2,000	✓	Low	High	3
Description 2	(F / E / M)	Owner B	Manager A	2-Mar-10	Med	High	6	Measure 2	\$5,000	✓	High	Low	3
Description 3	(L / R)	Owner H	Manager A	3-Mar-10	High	High	9	Measure 3	\$10,000	✓	Med	Med	4
Description 4	(O / M / H)	Manager A	Manager A	4-Mar-10	Low	Med	2	Measure 4	\$30,000	✗	Low	High	3
Description 5	(PoI)	Owner D	Manager A	5-Mar-10	Low	Low	1	Measure 5	\$100,000	☐	Med	Low	2
Description 6	(Envir)		Manager A	6-Mar-10	Low	High	3	Measure 6	\$15,000	☐	Low	Med	2
Description 7	(T / D / I)		Manager B	7-Mar-10	Med	High	6	Rigorous monitoring regime in place by client team and Technical Assurance. Establishment of migration plan, exit and mobilisation	\$2,000		Med	Low	2
Description 8	(Other)		Manager B	8-Mar-10	High	High	9	Measure 7	\$5,000	✓	Low	High	3
Description 9			Manager B	9-Mar-10	Med	Med	4	Measure 8	\$25,000	☐	Low	Low	1
Description 10			Manager B	10-Mar-10	Low	High	3	Measure 9	\$3,000	☐	High	High	9

Figure 4.13 – Example Risk Register

4.8 Influence Diagrams

An overview and some implementation note on the Influence Diagrams (reader should reference to the other Sections in TCM Framework with additional guidance on Risk Assessment). Often Risk Registers are input data to Influence Diagrams (see for example Figure 4.13).

Influence Diagrams can be easier for team to capture and understand rather than developing Decision Trees in the workshops. Several Software Applications exist which will build Decision Trees in the background of constructing Influence Diagrams.

Influence diagrams (see Figure 4.14) depict how various decisions and uncertainties relate to one another, and how they may impact the value measures that will be used to assess alternative strategies, investment opportunities and/or technology selections.

Uses:

- Gives structure to discussion of risks and potential impact levers
- Provides insight on what information must be collected
- Helps to structure a decision support model conversation
- Assist communication in a decision situation / issues and risks within a project team and engage other stakeholders

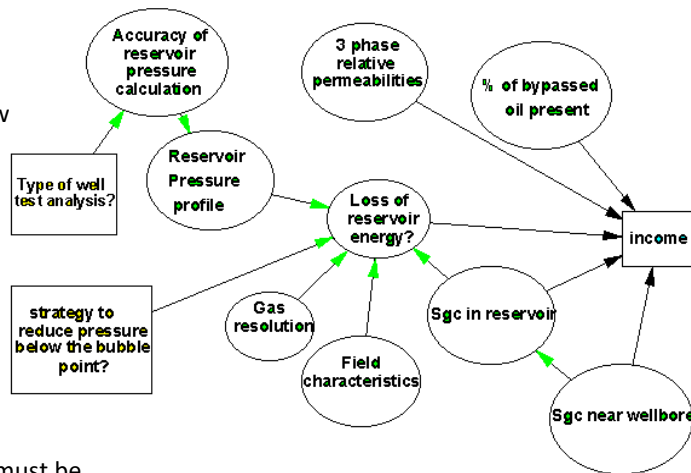


Figure 4.14 – Example Influence Diagram

The influence diagram accepted symbols: Ovals represent uncertainties, rectangles represent decisions, and octagons represent value measures. Ovals with a double line represent uncertain variables that are completely determined based on the variables leading into them.

Arrows between variables indicate dependence between variables. For example:

- An arrow from an uncertainty to a decision means the uncertainty will be resolved (the answer will be known) before the decision must be made
- An arrow from an uncertainty to another uncertainty means that knowing one variable would change one's opinion or beliefs about the other
- An arrow from a decision to another decision means that the first decision will be made prior to the second decision
- An arrow from a decision to an uncertainty means that the decision affects or influences an uncertainty

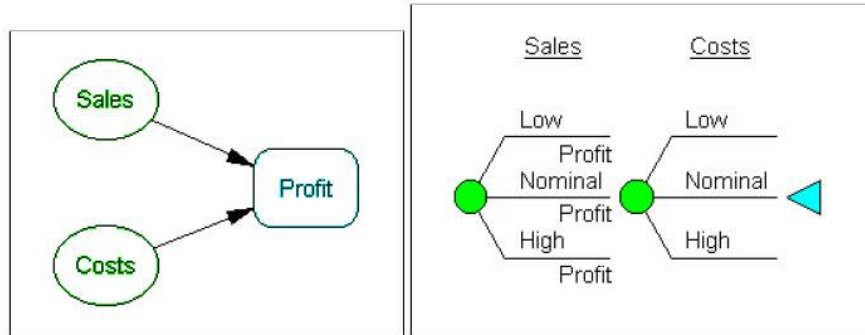


Figure 4.15 – Example Decision Tree built in software in background from constructing an Influence Diagram

To Create an Influence Diagram:

- Think about the high-level structure of the diagram prior to the team meeting
- Build the influence diagram by starting at the value measure and work backwards
- Ask questions like: "What piece of information would most helpful to resolve this uncertainty about piping cost?"
- Use the list of issues developed previously perhaps captured in a Risk Register, to stimulate ideas about what the relevant risk variables are and how they related to each other
- Use a generic Risk Checklist to stimulate additional ideas and ensure a complete analysis.
- Distinguish nodes that are deterministic (can be calculated directly from predecessors) and indicate them with a double oval
- Identify experts or contact points to help refine each variable and collect information. Assign team members to coordinate data collection

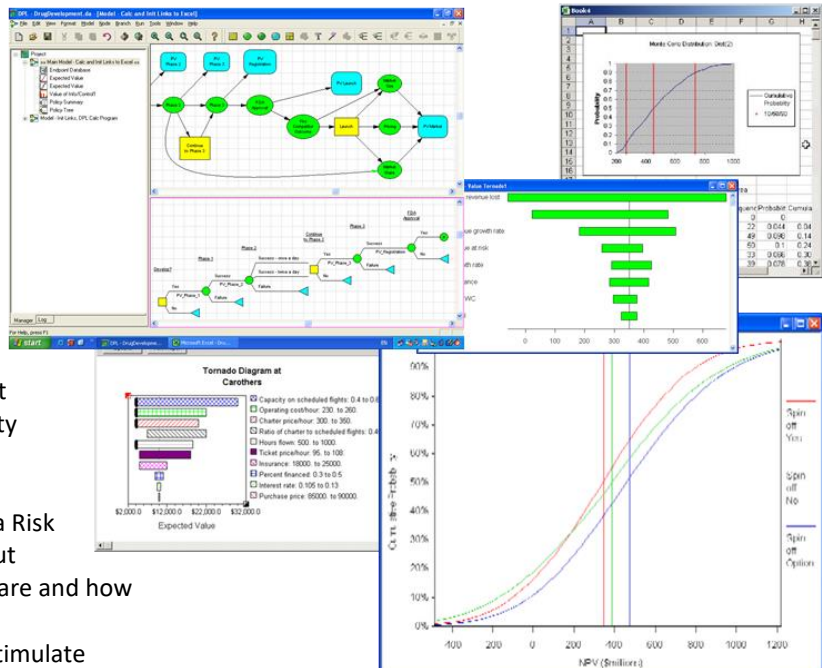


Figure 4.16 – Example outputs from Decision / Risk Models

October 25, 2018

Some software applications build the decision trees in the background from the Influence Diagrams (see figures 4.15 and 4.16).

Tips & Pitfalls: Be sure to involve a variety of parties so that all issues can be identified. *It is very important to have the judgement captured on options and probabilities from Subject Matter Experts whose judgement will not be challenged by Management or others.*

Decision Trees

Decision trees are useful to explore decision impacts and values. Most framing workshops only have time to set up the decision tree work scope. The tree analysis is conducted after the workshop with a small group. Running decision trees with large groups tends to be tedious. Decision trees are best developed and tested over several meetings. It is useful to conduct a certain amount of training and present examples of the tree deliverables in the workshop.

One significant advantage in using a decision tree approach is that the decision tree may be printed poster size to facilitate a discussion with management. In this discussion, the decision tree can be clearly viewed and tested rather than hiding a “Black Box.” This can be extremely useful for prioritizing alternatives for further in-depth analysis and for discarding alternatives that are clearly not worth pursuing. Developing decision trees is a skill set best delivered by an experienced facilitator(s).

In most cases, the development of effective Decision Tree based models takes several stages of team and decision maker interaction.

The output of analyses is often presented in graphical format to provide insights in Decision-making (Figure 4.16), however it is very important to remember that the software does not “make the decisions.” The software only provides insights to assist us in making Decision in the face of uncertainty. Therefore, it is normally advantageous to have the services of an experienced Decision Analyses professional to construct the model. Moreover, the leader of the Framing discussions should be knowledgeable on the software capability and limitations.

5. FRAMING TEAM INSIGHTS

Framing events can be and should be scaled to satisfy the business need. It is wrong to think of framing in terms of “how long” a session should take. Session duration is an “OUTCOME” of appropriate planning and necessary effort to deliver the rigor require for the DSP and should not be pre-ordained or artificially time constrained. Framing is a conversational process where collaboration is expected and business (project) clarity is delivered.

Time for effective Framing is uncertain. We encourage framing session **quality to be paramount**. But, a skillful facilitator can craft an agenda that effectively guides the framing effort and delivers a viable and timely agenda. Although many framing events (sessions) have a common format and agenda, EVERY event is different and must be crafted to suit the project’s unique needs and temperament.

DQ analysis and engagements should be looked upon as ongoing discussions, meetings and workshops, modeling & analyses, requisite to meet the project and Decision-maker needs. Singular workshop efforts can be detrimental to effectively using DQ. It takes a level of sophistication from both the Project Team and the Decision-Maker to support an effective ongoing discussion. Framing sessions need to be designed to achieve a good (or better) value using the time and resources available. Early as possible and routinely conducted sessions work best.

It is true that small projects can achieve the framing objectives in fewer sessions. Truly small projects can often simply draw from past experiences and reach consensus during a single, well designed session. Large projects may

October 25, 2018

be problematic since the organization and project scope changes (morphs, evolves) in the early stages. It is extremely important that large project develop a rigorous and formal schedule for updating the project frame.

Large projects cannot begin framing too early in the project development stages. The early framing agenda and expectations should be crafted to be flexible and to guard against “answers.” Early framing is about identifying opportunities and value alternatives. Often, these early DQ discussions are associated with making the decision to continue funding the project, whereas later discussions in FEL 2 and FEL 3 are more focused on improving project delivery.

5.1 Framing Learnings

Over years, project teams have observed that:

- Typical project reviews with management can become “self-fulfilling events.” If a manager “likes” something, the team may adopt that bias into the project management agenda and scope
- Creative alternatives are nice but the goal is to have alternatives that satisfy the “business” requirements. Simple, boring and off-the-shelf alternatives often make more sense than creative alternatives. Engineers like to be “creative,” which often complicates the business deliverables required. Technology has advanced so much, that we can be easily appear creative and ignore the simple, practical solutions
- Relevant and reliable information is very difficult to achieve. During framing, the team should understand the level of relevance and reliability of information that is requisite for the Decision Maker to make the decision at hand, in the face of uncertainty
- The world is awash in expert information, views and data. Project teams need to frame before looking for “relevant and reliable information.” Once the frame is reasonably finished (as best understood by the team), the integrated team must categorize and organize information such that a truly collaborative effort is possible
- In the broadest sense, project delivery trade-offs do exist and are made by the decision maker (owner). However, in the early framing conversations, teams should not look for “trade-offs” but should look for value enhancements that keep all the value possible
- Destroying project value through “trade-offs” must not be encouraged or allowed. Project teams are not delegated to destroy value but are expected to present viable and compelling value adding alternatives and solutions. Then, and only then, can a decision maker allocate (trade-off) project value based on business need. It is the project team responsibility to present the options and potential impact on the overall project delivery value
- Project management methodologies try to control project scope and activities. Continuity across a multi-discipline team addressing “asset to market” task is a project management challenge. Keeping the various work fronts aligned to the “business frame” (decisions) and ensuring timely discipline progress (not too fast or slow) is difficult. This challenge is not managed by application of DQ methodologies and analysis alone. And overall and requisite Project Delivery Process is required, and must be supported by both the Project Team, the Decision Makers and Senior Management

As an overview, a framing process is needed that addresses the “asset to market” aspects of a project. The framing process needs to encourage and manage a framing and value conversation across all the stakeholders. Stakeholders may include owners, project team, fabricators, constructors, suppliers, service providers, regulatory bodies, non-regulatory organizations, local social groups and possibly more individuals.

5.2 The Framing Event

1. A successful framing event requires carefully planning and significant pre-work. The event is rarely a “coffee and donuts” invitation. Over numerous workshops, we have learned that:

October 25, 2018

2. A clear, agreed workshop “terms of reference” must be crafted. An admission about why we are doing this framing and a recognition of the preferred deliverables must be written and approved by the highest management level possible
3. The meeting mechanics need to be planned, coordinated and tested. Venue, presentation equipment, housing and transportation, handouts, printers, Wi-Fi and working templates are a few items to consider. Experience has proven that finding the right venue can be VERY hard and problematic
4. The project must be carefully defined so that the disciplines, work fronts and other key considerations can be clearly identified
5. The participants need to be nominated and notified. The initial participant list can have “too many” names as it is easier to uninvite someone than to send a late invitation to them
6. How can the “point forward” framing discussions be presented? Are there key presentations that need to be made to ensure a common project understanding? If so, the presenters need to be coached to present and discuss the right information. Framing presentations are not history lessons
7. As possible, every participant should be contacted “eye-ball to eye-ball” to explore needs and expectations. Questionnaires are not very effective to motivate good session behavior and encourage active, constructive participation. Often the participant interviews reveal lost and incredibly powerfully insights that impact the design (crafting) of the framing session
8. Coaching potential “disenchanted” participants can save a lot of time and prevent a lot of grief
9. It is important to provide guidance to the reader about the serious preparation required for a successful application of the DQ methodology and other FEL engagements

There are many additional learnings that could be discussed. Framing sessions, large or small, must not be slapped together at the last minute. Good sessions require effort, resources and a genuine desire to define project success and achieve business objectives (see Figure 5.1).

We have rarely found that a questionnaire is helpful. We have found it more effective to produce examples of the preparation, the event and the deliverables with explanatory graphics and photographs of similar teams performing the work. This stresses the real work involved and moves potential participants away from the belief that they can simply show up and provide opinion. These engagements / workshops are real work and often quite tiring for participants.

If possible, “outsiders” or “wild cards” should be invited to the framing workshop. These individuals do not have a vested interest in the project and often bring external information that is well worth learning about. The framing workshop must reach a consensus agreement on boundaries and decision criteria. All stakeholders must agree with the agreed boundaries and decision criteria. No exceptions.

Potential Traps on the path to High-Quality Decisions	
Jumping to conclusions	... without first taking a time to contemplate
Frame blindness	... causing us to fail to see options or lose awareness of objectives
Not controlling our frame	... in defining the opportunity / problem or being unjustifiably swayed by the frames of others
Misleading ourselves about feedback	... from previous successes and failures
Overconfidence in our wisdom	... we have experience therefore we can make a decision without analyses
Hasty shortcuts	... and using ill-chosen “rules of thumb”
Let’s just do something	... or believing we can keep it all systematized in our heads
Group failure	... smart people do not automatically make excellent choices
Not focusing awareness on previous choice results	... of past decisions and consequences
Failure to audit the Decision making practice	... not tracking how Decisions were made to develop a consistent and repeatable process

Figure 5.1 – Decision Quality Traps

Large Projects: are typically viewed as complicated and involve a large number of discipline skills and diverse companies. Most, if not all, of the participants have very different views, needs and business agendas. The focus of these views changes as the project proceeds through the Front End Loading conversation.

Small Projects: need framing. Small projects are much less forgiving as far as budget and schedule expectations. Small project failure is noticed much quicker than large projects. Framing provides clarifies the intended work scope, aligns resources & information needed and organizes the work required. Small projects need “framing” even more than large projects. In many cases effective framing for small projects, as part of a small project portfolio, may be repeatable across a portfolio of small projects and as such have a significant positive impact on the overall portfolio performance.

Pitfalls: Historically poor project performance is not due to a lack of knowledge or tools. Poor business and/or project performance is largely due to:

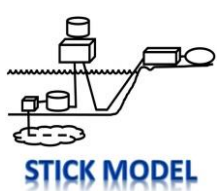
Taking insufficient time to frame the business opportunity	Too busy to plan. Do not have the time allocated in the schedule or the resources identified and allocated in the budget
Using the tools incorrectly to manufacture “feel good” results	Self-justification – we don’t need to think this way. In many cases with the limited understanding of the theory and toolsets
Poorly facilitated framing sessions to get a “check the box” results	Just do “something/anything” because it is a “company requirement” that requires a check mark for the Decision Support Package)

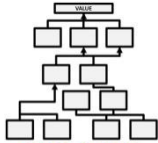
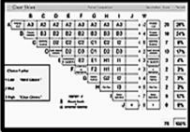
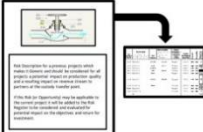
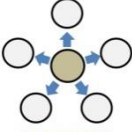
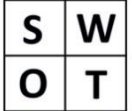

Participants: For framing and DQ to work, “Upper Management” has to demand that the appropriate level of work is presented in the decision support package. If management reviews use the probability analysis to make investment decisions, the project team will implement framing and DQ. Also, it is not unusual for companies to believe that the participants in Decision Framing should be from all facets of the project and those interested. This is may not always be the case. Participants should be those are required to participate in the discussion and can contribute to effectively generate strategic themes.


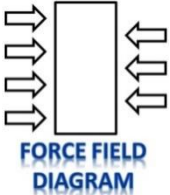
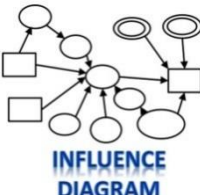

Framing workshops are an excellent way to engage owners, regulators and other non-governmental groups.

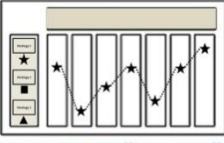


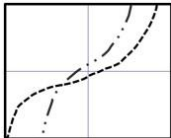
Roles: Generally, someone needs to be responsible for the framing meeting. For major projects it should be recognized there may be a series of engagements required including meetings with individuals and small groups prior to the decision framing meeting.

5.3 Example Framing Toolsets


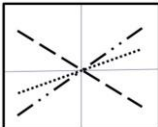


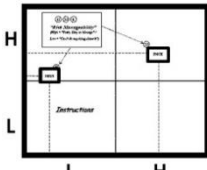
	<p>A Stick Model is a loosely drawn sequence of simple geometric shapes / figures. Teams use the stick model to characterize and acknowledge the boundaries and the physical reality that exist in the project. The stick model ensures that the project team and management can talk about the “same job.” It is not unusual for individuals to forget or confuse factual information ... the stick model helps to focus the team and keeps them honest.</p>
---	--

 <p>OBJECTIVES HIERARCHY</p>	<p>An Objectives Hierarchy is a powerful way to ensure Business and Project Decisions support “Project Objectives.” Further, it can be used to facilitate a discussion that reveals how to achieve multiple / alternative Objectives, for example, which decisions if, “made well,” will deliver the Objectives and what Actions we must take to be able to make those Decisions.</p>
 <p>SETTING BUSINESS PRIORITIES</p>	<p>Setting Business / Project Priorities (SBP) is a communication process that identifies the stakeholders' requirements and expectations for a business opportunity, translates them into measurable project objectives and ranks the objective according to their relative importance to the business strategy. It puts the stakeholders of the business opportunity in sync with the project team who can deliver the business results. It is an excellent pre-cursor to Decision Analyses and decision options discussion.</p>
 <p>RISK CHECKLISTS</p>	<p>Team members come to the workshop having reviewed a relevant Risk Checklist, which will help them identify any issues that are germane to their area of expertise. The Team members will add the issues identified and may then conduct a discussion to consider Porter’s Five Forces. Risks identified as relevant are then added to the Risk Register.</p>
 <p>PORTER'S FIVE FORCES</p>	<p>Porter’s Five Forces, to provide a means to review profitability factors such as suppliers, buyers, new entrants and substitutes.</p>
 <p>SWOT ANALYSIS</p>	<p>SWOT Analysis, to discuss strengths, weaknesses, threats and opportunities ...</p>
 <p>FUTURE MAPPING</p>	<p>Future Mapping tools, to develop possible scenarios...</p>
<p>In combination, the tools listed above help generate discussion of additional critical issues the Project Team will face during the Stage under consideration. The Decision Framing Workshop enables the Team to organize issues, create strategies and identify the relationship components. The following tools allow the team to subsequently Organize for Clarity:</p>	




	<p>The Decision Hierarchy uses the categories of:</p> <ul style="list-style-type: none"> • Given or “Policy” (Assumed; already solved; Defined as not to be changed) • Focus or “Strategic” (Decisions that are the current focus of the project) • Tactical (Important decisions that can be made later, no discussion at present) <p>Allows the Team to clearly set the boundaries of the decision problem(s).</p>
	<p>Following the creation of the Decision Hierarchy, the Team may apply the Force Field Diagram Procedure to study forces supporting the pros and cons of each decision item.</p> <p>Taking the results of the strategic issues portion of the Decision Hierarchy Table, the Team puts the decisions to be made into chronological order and identifies all the variations surrounding each strategic issue.</p>
	<p>Identify Relationships and Dependencies: Another technique that visually displays decision components with uncertain variables and their interrelationships is the Influence Diagram. The Team constructs an Influence Diagram to discover and develop a common understanding of this information. The Team selects a key value measure for the project, such as Net Present Value. Using this technique, the components used in the NPV calculations, such as revenues, costs, etc., are shown to the degree of detail needed, e.g., capital costs, operating costs, repair and labor costs.</p> <p>From this exercise, data sources are identified, calculated components are shown and the influence of the decisions under consideration is identified. Each Project Team member can identify where his/her particular contribution will affect the outcome of the decision process.</p> <p>This exercise also becomes a base for developing subsequent tools (i.e., Deterministic Model, Decision Tree).</p> <p>Finally, if the Team chooses to identify which components of the decision chain they have control or influence over, it can illustrate which elements are used in deterministic modeling and which are the object of probabilistic modeling.</p>
	<p>Focus Decisions are placed in a row across the top of the table and creative options for each Decision are listed in columns under each. These Options identified must be Creative and Doable, Mutually Exclusive, Compelling to analyze and cover the spectra of Decisions potentially available.</p>

 <p>STRATEGY "THEME" TABLE</p>	<p>Identify Options/Create Strategies: The strategic issues, their variations and results from the preceding exercises will now be used to create a Strategy Table. This tool helps the Team clearly delineate all the options available for each type of decision. In the Decision Set table, the decision titles have already been placed in a row across the top of the table and creative options for each strategic decision have been listed in columns under each. The facilitator asks the Team to suggest strategies that are central to the project and place them in the extreme left column of the table. These are called "Strategy Themes" and might include low cost, minimum capital exposure, minimum risk, and earliest revenue stream. The proposed strategies should cover a range of creative options. (These potential Strategies are described in detail in separate pages to differentiate them clearly. Normally 4 to 6 potential investment strategies are sufficient to cover the investment opportunity space)</p> <p>The Team then decides which of the options listed under the strategic decisions (across the top) fit or complement each Strategy Theme. Options that do not support a Strategy Theme can be discarded. Others might support more than one strategy, making this a good time to identify hybrid strategies.</p>
 <p>DECISION RADAR</p>	<p>Check Decision Quality/Confirm Boundaries: The Project Team will check with Decision Makers against the six elements shown in the diagnostic Decision Radar Diagram tool. The Team will then conduct a review with Decision Makers to determine that the decision is properly identified and that bounded issues are being addressed in the proper perspective and are in keeping with the Decision Makers' experiences and vision.</p>
<p>Building from the Influence Diagram, the Assess phase begins by constructing a Deterministic Model. This is a spreadsheet-based, economic model used as a reference for comparing various risk components. The model allows the Team to make "apples-to-apples" comparisons of how specific scenarios would impact a project's bottom line. It often focuses on the Net Present Value of the project, or another appropriate ROI measure, to gauge the project's economics. While values are never precisely known, predicted values and ranges should be established using the best information available.</p>	
 <p>TORNADO DIAGRAM</p>	<p>Prioritize Risk Drivers: After the model is built, the Tornado Diagram is constructed. This tool gauges the effect of a variable on a value measure (such as NPV) and prioritizes the variable impact from high to low. The key drivers identified will provide insight to the Project Team about resource allocation and strategic direction.</p>
 <p>PROBABILISTIC MODEL</p>	<p>Calculate Risk Probabilities: Key drivers identified from the Tornado Diagram, especially ones that we can control, provide critical input to the Probabilistic Model. These models can take the form of Decision Trees or Monte Carlo simulations. Refer to the Toolbox section of this Manual for the distinction between these two. Both techniques will establish cumulative probability versus NPV (or any chosen value measure) for a particular strategy or option under consideration. This step allows the Project Team to more closely examine strategies depending on risk tolerance of business goals.</p>

October 25, 2018

 <p>VALUE OF PERFECT INFORMATION</p>	<p>Consider Various Risk Scenarios and Sensitivities: Using a Decision Tree for the Probabilistic Model is often advantageous because it can be used to determine certain insights. For example, if Decision Trees are examined so their “decision nodes” are reversed to show that uncertainties precede decisions, and if the NPV of both approaches is compared, then the difference in NPV is the Value of Perfect Information (VOPI). Similarly, Decision Tree nodes may be examined so that branches with the most favorable and controllable scenarios are assumed to occur. The resulting economics can be compared with expected scenario economics to determine whether it’s worthwhile to pursue the more attractive scenario.</p>
 <p>SENSITIVITY TO PROBABILITY</p>	<p>Sensitivity to Probability: This will not judge if perfect information is available or possible but will suggest that if the perfect information does not change a decision, i.e., no increase in NPV, then acquiring the information may have no value. Similarly, this model is useful in assessing the sensitivity of a decision to the probabilities used to construct the model.</p>
 <p>VALUE OF CONTROL</p>	<p>Somewhat similar in calculation we may gain insights as to the value of control of particular Uncertainties and the potential value of investment to exercise that control</p>
 <p>DECISION RADAR</p>	<p>At the close of the Assess step, the Project Team may again check for decision quality using the diagnostic Decision Radar Diagram tool. (This tool is reasonably quick to use and does not require consensus) The Team will then conduct a review with Decision Makers to select the risk scenarios that warrant additional consideration. Together the groups determine that</p> <ul style="list-style-type: none"> • Real alternatives for analysis are available • Issues are being addressed in the proper perspective • Issues reflect Decision Makers’ experiences and vision
 <p>QUALITATIVE RISK ANALYSES</p>	<p>Consider Probability and Impact of Major Risks: Organizing and presenting risk variable information can be aided by the use of a Qualitative Risk Analysis tool. It requires plotting relevant risk issues on a graph showing the likelihood of occurrence as the X-axis and the severity of impact as the Y-axis. In this manner, relative risk importance can be easily compared, and shared, in a qualitative way</p>

October 25, 2018

	<p>Develop Response Plan for Each Major Risk Contingency plans and/or strategies can be developed from a Risk Response Plan Checklist. Its use assumes that major risks have been identified utilizing the Influence Diagram, Risk Checklist and Qualitative Risk Analysis Grid. For each major risk, propose a response plan that ranges from “Risk is recognized but accepted...” through “Transfer to others through contract or insurance...” Budget for Risk Plans: The response plan should identify funds or efforts—fees for permitting, emergency equipment or materials and so forth—that may need to be included in future budgets.</p>
	<p>Check Decision Quality: At the close of the later Stages, the Project Team has the option to check itself for decision quality using the diagnostic Decision Radar Diagram tool. The Team may then conduct a review with Decision Makers to determine that issues are being addressed in the proper perspective and are in keeping with the Decision Makers’ experiences.</p>
	<p>These toolsets and others including Value Improving Practices recognized by the Construction Industry institute can be combined in progressing major projects and are often useful to engage particularly at the start of the FEL 2 Stage of Project Front end Loading</p>

6.1 REFERENCES

1. C W. Jennings 2003, *Stick Model used with permission*
2. Keeney, 1992; R. Clemen 1995; Augmented with Decisions & Actions, C. Jennings & J. McCuish, 2002, *used with permission Objectives Hierarchy*
3. C. Fallon, 1980; J. Kaufman, 1985, *Setting Business Priorities*
4. Decision Radar: R. Howard 1980, Stanford & Strategic Decision Group, 1994
5. R. Howard 1980; R. Clemen 1996; Strategic Decision Group 1994; D. Skinner, 1995, *Decision Classification, Decision Sets, Investment Themes, Influence Diagramming*
6. C. Bytheway, 1971; J. Kaufman 1994; McCuish, Denton, Jennings 1994-2004, *Organization Mapping: (Function Diagram)*
7. J. McCuish 2002, *Integrated Value Practice Methodology, SAVE Conference*
8. C. Jennings, J. McCuish, 2003, *“Blue Sheet” Methodology used with permission*
9. Roy Woodhead & James McCuish, *Achieving Results; How to create value, Thomas Telford Press, 2002, ISBN: 0 7277 3184 X*