THE DEVELOPMENT AND OPERATIONS OF A VALUE MANAGEMENT PROGRAM AT THE PORT AUTHORITY OF N Y AND N J

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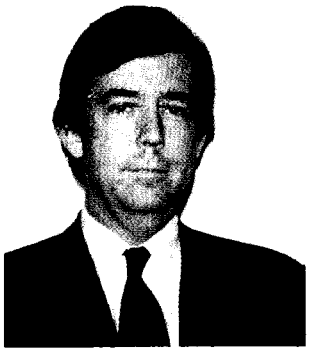


Mr. Harvey, in addition to his other management responsibilities, developed and directs the Value Management (VM) Program that uses outside experts to analyze, functionally improve and reduce costs on close to $4 billion in capital projects. This effort has resulted in a potential savings of nearly $1 billion since 1992. Following the February 1993 terrorist bombing of the World Trade Center, Bob established the Project Control Team and developed and implemented a project control system to recover the complex, for which he was honored for Valor and Exceptional Service to the Port Authority.

Before joining the Port Authority, Bob was responsible for planning international projects and project management research for Exxon. A professional engineer with degrees in architectural and civil engineering, Bob has a graduate degree from M.I.T. in Project Management.

ABSTRACT

The Port Authority of New York and New Jersey VM Program has four guiding principals which we feel make it unique. These principals rest firmly on the idea of bringing Value Engineering (VE) concepts directly into the board room with a focus on major policy issues. This paper outlines these four principals and examines what we consider to be important innovations in the application of the VE methodology.

The Port Authority of New York and New Jersey, identified the need for a formal VE program in late 1991. In our agency, we have expanded the VE concept into our board room with its focus on major policy issues and where a VM philosophy now prevails. We've also brought VE back to a much earlier point in the process of planning new investments. It's working for us across a wide range of projects and issues.

I'll focus on four points today:

The best value comes from re-examining the project purpose, concept, and functions, not just the design, using a "Total Quality Management" approach; bringing in a range of expertise from outside the organization makes the process much more effective;

A central part of the process is evaluating risks associated with a project and finding ways to reduce those risks; also review of the organization constraints placed on the project can have benefit and -- VM is not just about saving money -- it's also about exploring new technologies/theories approach and getting the best possible project.

But that said, let me emphasize that when you do it right, it almost always saves money in construction, operation or life cycle costs. It can even increase revenues.

Lastly, I will go into more detail on what we consider some of the innovations of our program and how they work in synergism.

The Port Authority Background

For those of you who don't know us, The Port Authority is an agency chartered by New York and

New Jersey to support trade and commerce in the metropolitan area. Created in 1921, it was part of another generation's push to "reinvent government," with a groundbreaking bi-state compact ratified by the Congress.

Our portfolio includes bridges, tunnels, transit facilities, three major airports, marine terminals, industrial parks, a resource recovery plant and The World Trade Center, among others.

These are among the busiest facilities of their kind in America. Directly and indirectly, they support more than 440,000 jobs.

We earn our own budget with user fees, commercial rentals, and other income, and we pool our revenues to support long term bonds for capital investment. We have spent around $4 billion since the inception of our program in 1987 and around $4 billion is programmed through 1998, not including passenger flight charge funds we spend on projects and billions more in private equity investments at our airports and other facilities. We manage one of the largest and most diverse public works programs in the nation.

Like other agencies, we have had our share of setbacks on capital projects in recent years. What we learned, at some cost and sometimes embarrassment, is that the biggest problems often arise, not from flawed engineering, but from external factors that could have been better anticipated. These include market demand, revenue forecasts, patron and tenant expectations and environmental issues.

VM: More Than VE

VM is a three-step process that looks at a project at key points in its development. It begins at the conceptual level of project planning by examining the basic assumptions underlying a proposed capital investment. In this first step, which we call Value Planning, we look at objectives, to be sure that a project is needed and that it represents the best response and the right timing. That kind of conceptual review, early on, is the best point in the process to grasp the pitfalls -- and the opportunities -- inherent in most major public works projects.

Our next close-up examination takes place after a project has complete conceptual planning, and has a validated selected alternative approach to specific project objectives. The objectives are also validated by the outside value planning team. This is when we conduct a VE analysis, which produces refinements in design, explores new technologies, reviews construction phasing, reviews integration with operating needs, and other factors. It also seeks to mitigate the risks associated with the project; assuring the highest probability of success. Let me note here that VE review savings, though important, have a less profound impact on the overall project than those generated at the value planning stage. In both value planning and VE, the organizational plan to carry out the project is reviewed and an assessment of risks performed.

We also look at projects and groups of projects during construction and after completion to see what has gone right and what has gone wrong. At The Port Authority, we call that third step our Project/Program Management Review. Because the results of project reviews come late in the life cycle of the project, they tend to have relatively smaller effects on cost , but they can have a significant impact on the way we manage specific types of projects in the future.

Outside Experts

A major step in the evolution of our thinking about these reviews came when we realized that outside expertise adds enormously to the process. The basic methodology of VE is group interaction for functional analysis, and in the beginning we used ad hoc teams of Port Authority staff, drawing upon the vast range of skills within the agency. We have many talented career professionals, but since 1991, we have refined the program by recruiting teams of outside experts. This adds world-class expertise, a measure of independence and a comparative perspective that makes it much less likely that a major flaw -- or good opportunity -- will escape the rigorous review process.

Over the last three years we have made VM part of our way of doing business, and we have worked with over 300 outside experts. We have developed a database of well over 400 individuals, which enables us to assemble a range of people with the right academic and professional backgrounds for a given project, as well as the right certifications.

This team of outside experts operates at a professional arm's length throughout the entire process, up to -- and sometimes including -- presentation to our Board. We support this group with Port Authority staff who are familiar with that particular facility and with our policies, procedures

and business requirements for the issue at hand. The Value team of outside experts is sequestered during key phases of the analysis, but Port Authority resource staff provide them with help when requested.

More Than Saving Money

I want to emphasize that our goal in VM is not simply saving money; it's also a search for the best possible project -- for the course of action that offers the most value that anticipates and controls the risks and that best supports our public service mission. In fact, cost savings can almost be viewed as incidental to VM where the real aim is excellence. VM reviews at The Port Authority sometimes add elements to a project, where we see a chance to get more value for our investment and for the people of New Jersey and New York.

But that said, we have identified significant savings through VM. Examples among other savings, we cut $400 million from the anticipated $800 million cost of the International Arrivals Building at John F. Kennedy International Airport, and we identified another $10 million in savings on the $110 million international terminal at Newark Airport. The overall figures are even more impressive. During the first year of the program, 1992, we identified some 6% percent of potential savings on almost $1 billion of projects we analyzed; the following year, 1993, we found potential savings of more than 20 percent or $254 million on projects that also totaled roughly $1 billion. Results for 1994 reached an all-time high with close to 40 percent savings or $640 million on projects totaling approximately $1.7 billion. Let me now recount two brief examples of how the process works to save us money in an unconventional manner.

Perhaps the best-known example is the recovery of the World Trade Center after the terrorist bombing just over one year ago. We decided early on that, rather than using VM simply to achieve its usual objectives of optimum costs and schedule, we would use it in an unconventional way, to "crash" or accelerate the schedule and come up with technical "workarounds." We did this because we determined that keeping the Trade Center closed had consequential costs of close to $1 million per day; the incremental costs of acceleration were much less. This approach worked extremely well, helping to bring the Twin Towers back on line faster than anyone predicted. The other example is also from the Trade Center. We brought together a diverse team of experts -- from investment bankers to architects and engineers -- to help us figure out how to maximize revenues while keeping the Twin Towers a Class A complex for the minimum amount of capital invested. Their answer, interestingly enough, called for redesign and reconstruction of the Trade Center's public spaces. This approach could save as much as $100 million when compared with the earlier approach.

BEYOND VE: PROGRAM INNOVATIONS

It seems several key aspects of the Port Authority's VM Program may be unique or unusual in application of the VE methodology in the public works or corporate situation. For that reason, it may be useful to go into more detail on what we consider innovation in the application of the VE methodology. They include such as the following program aspects:

More On The Process

Our broad application of the methodology and integration of the VM program with the Agency's project development and Board authorization process has significant benefits. This allows complete project review from broader issues, objectives and external factors such as market demand, revenue forecasts, public expectations, and other financial, planning, conceptual considerations at Value Planning. Also, it allows a more specific review of technical and project management functions at the VE and Mangement Review phases, shown on Attachment A.

These analyses are done within the context of the analytic framework used by the Agency to evaluate projects, including alternatives and financial analysis.

The VM takes the alternatives analysis to the next level of rigor. The program also involves an Architectural Review function. It balances the alternatives analysis through consideration of technical, ethical, aesthetic and cost factors. The evaluation of ethical choices is possibly the most complex focus of the program. While individuals have preferences, it is value and collective preferences of society that are codified into laws, codes and regulations. Similarly organizations have preferences embodied in policies. Some of these considerations as used in our VA are set by professional codes of good practices, other by rational analysis and still others are subjective or subject to interpretations. Similarly, the society expects a judicious allocation of its resources and

expect it to be achieved through rigorous alternatives analysis considering costs and aesthetics of technically feasible alternatives. Among the considerations of this analysis are capital costs, life-cycle costs and long-term ecological considerations. Our program reviews our projects with this balance as its overall objective.

The Reporting Relationship

The executive reporting relationship of the program, is demonstrated by both where the program resides in the organization, the Office of the Executive Director and the Value Board mechanism. The program reports to a Value Board made up of our highest levels of executive management. This approach allows the analysis and constant improvement of policy as well as the rapid and complete close-out of difficult and policy-related issues.

Selection of the Outside Expert Teams

As mentioned earlier, we feel outside expertise adds enormously to our program. Each project has the integral and early involvement of the sponsoring line and key staff departments to facilitate the reconciliation process, the scope of analysis is structured, within the parameters of the program, and the team of outside experts is selected jointly by the VM Program Director, the sponsoring department, as well as senior technical and financial staff. The staff and sponsoring departments have a minority number of advisory members on the team to explain the organizational structure, policies and procedures.

Timing of Analysis

We apply VM early on in the project development cycle with the emphasis on achieving the best possible project to provide the necessary functions in the most efficient manner possible. This approach manifests a TQM philosophy since the definition of "quality is the essential charter of something" which relates to providing the necessary, but all necessary functions to meet the project objectives. This also involves the appropriate expenditures on the planning, design and implementation without making unsound investments in unnecessary functions.

Project Risk Assessment

Project Risk Assessment is a key element of any value planning. It is added as part of the creative, VE process. We ask the team to consider the risks and possible ways to mitigate the risks associated with each of the recommendations. Since this is done during our value planning phase, we actually "value engineer" the higher order business, operational and management risks associated with such things as market demand, revenue forecasts, public/tenant perceptions of service, management of complexity, etc. Technical risks are also assessed both in the value planning and later VE phases. The result may be quantitative or use probabilistic techniques to combine uncertainties in a number of risk areas to produce a Net Present Value Analysis (VA) that point to the efficient alternative approach. In either event, the results are supported by the Construction Risk Analysis that is described below.

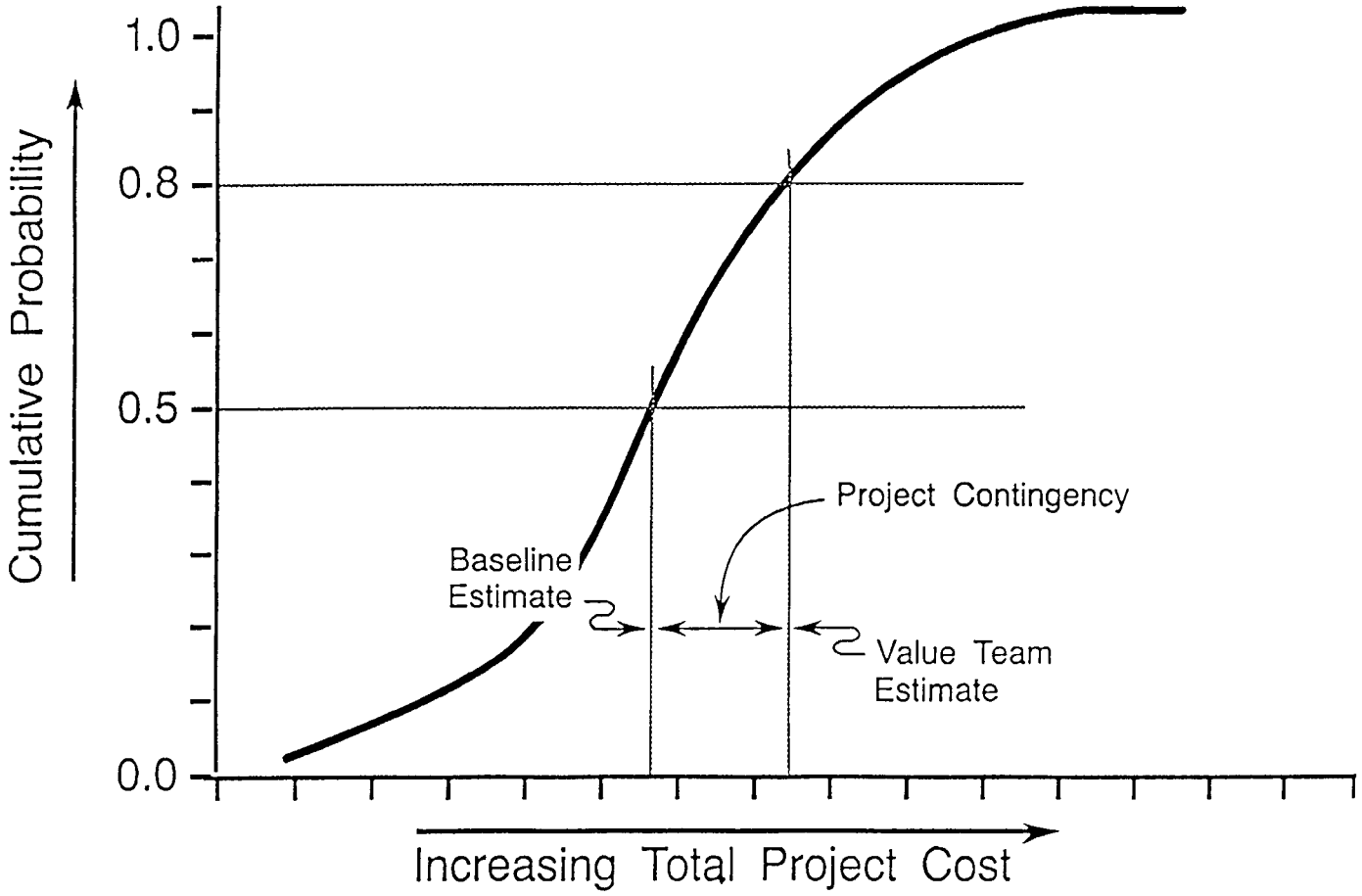
Construction Risk Analysis is conducted as part of all Value Planning and VE analyses.

Construction Risk Analysis analyzes risk at a technical level and uses nationally eminent experts as part of the value team to analyze uncertainties and scenarios associated with capital costs and schedules. Coupling this technique with VA provides an opportunity to use the expertise that has been brought together as part of the value team expertise in another productive area. This approach reviews and validates or modifies the construction cost estimate, total project cost estimate and level of project contingency. The analysis uses the judgment of experts that make up the VM team and applies probabilistic techniques to identify and combine uncertainties. The result is a probabilistic distribution of project costs. As shown in the attachment, this allows The Port Authority to adjust the level of project contingency to the level of the project's development and project cost certainty.

Review of the Project Management Plan

One last, but also important area of review by the outside team is the project management plan, which is a document prepared to indicate the organization, authority delegation and resource allocation to carry out a project within a set schedule for a cost. We ask the team to review the way we have organized to carry out the project. We also ask them to review and risk analyze the schedule within the context of constructability and the organization constraints place on it. We feel that the combination of all of these variations on the theme of VE work in synergism to give us the best projects possible.

Risk Analysis



The Port Authority of New York & New Jersey's
Capital Project Development & Authorization Process

Stage One:
Concept Development

- Identify Need, Goals & Objectives
- Develop, Analyze & Select Alternative
- Request Board Planning Authorization

Value Planning (VP)

Project Risk Assessment
- Construction Risk Analysis
- Finance Risk Analysis

Stage Two:
Prelimary Design

- Develop Detailed Functional Plan
- Develop Preliminary Design
- Request Board Project Authorization

Value Engineering (VE)

Project Risk Assessment

Stage Three:
Final Design

- Award Contracts

Stage Four:
Construction

Program/Project Management Review