Portfolio Decisions to Maximize Strategic Benefits[1]

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Abstract

Success in project portfolio management depends on people, culture and governance, more than on any specific tool or technique. Even in organizations with the right culture and processes, many struggle to make portfolio decisions that maximize strategic benefit. Too often, projects are randomly identified, discussed to exhaustion, arbitrarily ranked and scored, and then finally chosen as a means to end interminable meetings, resulting in selection of the wrong projects and misallocation of organizational resources.

Even with the right foundation, managers grapple with endless dialogue or produce inaccurate portfolio priorities, often without knowing it, because the decision process lacks structure, and those participating fail to realize that program and portfolio decisions are complex enough to exceed the grasp of human cognition. This paper establishes portfolio selection as a complex decision problem and offers tools and techniques to help managers productively and accurately select the projects and programs that maximize strategic benefit.

Introduction

Success in project portfolio management depends on people, culture, governance, and often, transformational change of attitudes and processes, more than on any specific tool or technique. That said, many organizations with the right culture and processes struggle to make portfolio decisions that maximize strategic benefit. Too often, projects are randomly identified, arbitrarily ranked or scored, discussed to exhaustion, and then finally chosen as a means to end interminable meetings, resulting in selection of the wrong projects and misallocation of organizational resources.

The portfolio and its member projects and programs are the "bridge" from expectations in the strategic planning process to benefits realization after delivery, when the projects become operational. Organizations perform portfolio management to (1) select the combination of projects anticipated to deliver the greatest strategic benefit, (2) measure their performance during execution to assess the degree of continued expectation of strategic benefit, and (3) transition completed projects to operations for actual delivery of strategic benefit.

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Even with the right foundation, managers grapple with endless dialogue because the decision process lacks structure, and those participating fail to realize that program and portfolio decisions are complex enough to exceed the grasp of human cognition. Selecting the right combination of programs and projects is critical; perfect metrics and great transitions don't matter if we've selected the wrong ones.

This paper establishes portfolio selection as a complex decision problem and describes an approach portfolio decision makers can use to productively and accurately select the projects and programs that maximize strategic benefit. It is about how to replace fruitless discussion, ad hoc processes and even ranking and scoring models with tools and techniques that improve the quality of portfolio selection decisions; and it is about how we can borrow tools and techniques from decision sciences and psychology and apply them to selecting project portfolios.

Context and Goals of Project Portfolio Management

The term PPM (project portfolio management) is used in many ways. For those who may have a different definition, let's establish a common understanding of the meaning of PPM as used in this paper.

Definition of PPM as Used in This Paper

PPM is the set of processes, people and tools to select and execute a set of projects that, in combination, optimize achievement of the organization's strategic goals and objectives, subject to specified organizational constraints and funding.

According to PMI, "Portfolio Management is the coordinated management of one or more portfolios to achieve organizational strategies and objectives. It includes interrelated organizational processes by which an organization evaluates, selects, prioritizes, and allocates its limited internal resources to best accomplish organizational strategies consistent with its vision, mission and values … " (PMI, 2013, p.5).

PPM should not be confused with project management, enterprise project management or even program management, which are arguably focused on "doing things right", that is, completing projects efficiently and effectively regardless of their strategic value. PPM is "doing the right things"; that is, selecting the right combination of projects and programs to deliver the most benefit in terms of achieving strategic objectives.

Goals of PPM

In this context, PPM improves the chances of achieving the organization's vision by accomplishing strategic objectives. The goals of PPM for many organizations include:

Ensure strategic alignment, which means that (a) the portfolio(s) of projects reflect the organization's strategy; (b) all projects are on strategy, support the strategy, or are critical components of the strategy; and (c) spending allocations are tied to the business strategy -- for example, to defined areas of strategic focus.

Maximize the value of the portfolio for a given spending level, which means the portfolio comprises the combination of projects that maximizes the sum of the expected benefits in terms of achieving business objectives.

Achieve balance in terms of long-term versus short-term, high-risk versus low-risk, across various markets, technologies, product categories and project types.

Efficiently utilize constrained resources -- nearly all organizations have limited resources; PPM seeks to apply constrained resources to projects providing the most value.

Key Factors in Effective PPM

The portfolio and its member projects and programs are the "bridge" from expectations in the strategic planning process to benefits realization after delivery, when the projects become operational.

Project portfolio management is not a magic elixir and it does not guarantee success in achieving strategic goals and objectives. Many other factors contribute to success or failure of the portfolio. However, an effective PPM process can increase the chances of success by selecting, implementing, monitoring and successfully completing projects that are traceable directly to the strategic plan. To achieve this, a few key factors need to be considered.

1. One key factor is to select projects that best contribute to accomplishing strategic goals. This means establishing the relative benefit of each candidate project, and then selecting the combination of projects that yield the optimal total strategic benefit.

2. Another key factor is a PPM process with the flexibility and agility to adapt to changing strategy and performance. This is not to suggest frequent changes to the portfolio, such as weekly or monthly; it does mean that the PPM process needs to be responsive to strategy revisions and updates, and can adjust the composition of the portfolio as needed – whether that's a result of changes to the strategy or termination of poorly performing projects or both.

3. A third key factor is the ability to monitor and adjust the portfolio to ensure it continues to provide strategic relevance, and later, to manage actual benefits against expectations.

To expand on the first key factor, before choosing a portfolio, we need to determine each project's relative importance, or the strategic benefit the project is expected to provide relative to other portfolio candidate projects. That's a tough challenge for many organizations because of the complexity of the decisions required to do so.

In this paper, we propose to establish portfolio selection as a complex decision problem, and then describe tools and techniques to productively and accurately structure the objectives and candidates, map them to the strategic goals they support, and select the optimal combination of projects and programs to maximize strategic benefit.

Common PPM Selection Practices

Many organizations struggle with establishing a framework for making portfolio selection decisions, and look for ways to improve both the quality of the decisions and their productivity in reaching them. To understand why portfolio selection decisions are often difficult, we'll discuss some common portfolio selection approaches and their shortcomings; describe how human cognitive limitations, conflicting objectives and complexity make these decisions more challenging; and then suggest an approach that provides a means to overcome these issues.

Current Selection Decision Approaches and Their Shortcomings

Today, organizations use many methods for choosing a project portfolio, some faster and more productive than others, and some that produce higher quality selection decisions than others.

Why Most Current Selection Approaches Fall Short

Portfolio selection decisions are complex because they involve many elements, make us deal with conflicting objectives and include both quantitative and qualitative factors. Since strategic benefit is a key component in selecting portfolios, and later, in measuring strategic performance, the benefit needs to be derived in a manner that (1) addresses complexity, (2) considers both financial and non-financial objectives, and (3) combines the input of multiple participants to produce mathematically valid and comparable results. The selection decision techniques described below are not ideal for this purpose but are nonetheless in common use.

Executive Fiat

Dictates from above are decisions made via executive fiat. Such decisions may be made very quickly, but they may also be of limited quality. How were such decisions made? Executives are human beings who encounter the same issues described with other current decision approaches. Implementation of such non-participative decisions may encounter resistance, particularly in the absence of communicating the reasons for such decisions.

BOGGSAT

BOGGSAT is an acronym for "bunch of old guys/gals sitting around talking". This is a common method that produces decisions that are often painfully slow, unproductive, and of poor quality. Although it is the most common decision approach in use today, BOGGSAT is not appropriate for complex decisions such as project portfolio selection and determining benefits. A major reason BOGGSAT fails as a decision technique is that, as psychologists (Miller, 1994) have found, the average human brain can discriminate among only seven elements, plus or minus two, and can hold in short-term memory only seven objects, plus or minus two. That is, we humans have cognitive limitations that prevent us from mentally processing the complexity that exists in PPM selection decisions.

Ranking and Scoring Models

To counter the deficiencies of BOGGSAT, many organizations use portfolio selection ranking and scoring models. However, what they are often doing is to produce meaningless results by performing mathematical operations on ordinal numbers. If 20 projects are ranked from 1st to 20th, how much more important is the first than the second project, or the second project than the last project? Performing arithmetic operations on ordinal numbers yields mathematically meaningless results. This includes applying weights to criteria and then multiplying them by ordinal numbers to obtain scores. Even if there is no intent, we inadvertently misuse numbers to produce nonsense. So, if BOGGSAT results in poor and untraceable decisions, and most ranking and scoring models produce mathematically invalid results, then how do we handle complexity and derive meaningful and comparable values for benefits?

Cognitive Limitations, Conflicting Objectives and Complexity

PPM selection decisions are some of the most complex and most important decisions any organization can make. They determine which projects are chosen in order to maximize strategic value. "The ability to structure decisions, measure options, and synthesize the measurements to derive priorities is critical to implementing and maintaining an effective PPM process and selecting optimal portfolios", (Bible & Bivins, 2011). The selection decision methods used can make the difference between good decisions and bad ones.

First, we need a way to structure the complexity; humans nearly always use hierarchies to address complexity. Herbert Simon recognized that large organizations are structurally hierarchical; they create units, which are divided into smaller and smaller subunits. He noted that hierarchical subdivision occurs in all complex systems, and is how humans with limited cognitive powers can address complexity (Simon, 1960 and SABLE, 1999). Lancelot Whyte declared hierarchies to be the most powerful method of classification used by the human brain to order experience, observations, entities and information (Whyte, 1969). Hierarchies provide the means to break down complex decisions into simpler parts, structured into hierarchies in which each level contains no more than seven (plus or minus two) elements. That is, we break the complex problem down and structure our decisions commensurate with human cognitive abilities (so we can cope).

Second, we need to choose a conflict-confronting decision strategy to help us make trade-offs among conflicting objectives. Conflict-confronting approaches are compensatory. That is, they allow us to trade off a low value on one dimension against a high value on another. Conflict-avoiding approaches, on the other hand, are non-compensatory. That is, they do not allow trade-offs (Hogarth, 1987, p. 72).

Nearly all complex decisions involve conflicting objectives – for example, we want to consider both price and number of stops when acquiring a plane ticket. In managing a financial portfolio, we want to maximize our returns while minimizing risks. So, too, nearly all organizational strategies contain conflicting objectives, and we need a way to confront these conflicts.

To structure complexity and address conflict when making effective PPM decisions, we now turn to some tools and techniques from the decision sciences and psychology and apply them to PPM decisions. Specifically, we use these tools and techniques to (1) prioritize the portfolio candidates based on their relative strategic benefit, and then (2) optimize to select the combination of projects that is expected to deliver the maximum strategic benefit.

Establishing the Relative Strategic Benefit of Each Portfolio Candidate

Until recently, making such compensatory choices was infeasible because the number of alternatives was beyond human cognitive abilities, and the calculations were beyond the ability of affordable computing. Now, we have multi-objective decision methods like the Analytic Hierarchy Process (AHP), and available software and computer technology to support them.

AHP provides a conceptual process that allows people to structure complex decisions, and to incorporate both qualitative and quantitative assessments, as well as intuition, into the process of decision making. Based on both mathematics and psychology, AHP is used around the world in a wide variety of decision situations, in fields such as government, business, industry, healthcare, and education, and is widely taught in university schools of engineering and graduate schools of business. It is a particularly important subject in the quality field, and is taught in many specialized courses including Six Sigma, Lean Six Sigma, and Quality Function Deployment (QFD).

Introduction to AHP

AHP was developed by Dr. Thomas Saaty at the Wharton School of Business in the 1970s (Saaty, 1986) and is used to make compensatory personal and professional decisions with relative ease, including PPM selection decisions. AHP allows for the complexity of conflicting objectives and plentiful alternatives to be structured into manageable hierarchical models, with evaluations that yield mathematically valid ratio scale results. In other words, AHP can help people address both complexity and the need for mathematical validity, delivering much more productive and accurate results.

To derive a meaningful assessment of strategic benefit, we must consider both the project candidates and the organization's strategic objectives. AHP allows us to structure the decision, measure the responses of the evaluators, iterate if necessary, and produce a mathematically valid priority, or relative strategic benefit, for each portfolio candidate.

Using AHP to Determine Relative Strategic Benefit (Priority)

AHP is particularly applicable in group decision making, such as portfolio selection. The three basic steps of AHP are structure, measure and synthesize.

1. Structure -- AHP provides a method to structure major decisions into hierarchies of objectives and alternatives (i.e. projects being considered for the portfolio), to simplify complexity as we noted earlier, and give us structure to approach the decision problem commensurate with our cognitive abilities.

2. Measure – We perform pairwise comparisons of all strategic objectives being considered, by comparing two at a time until all objectives have been compared to all other objective; we then evaluate each of the projects that support each of the objectives compared to the other projects supporting the same objectives. This serves as the basis for determining the relative importance of each objective, and each project with respect to each objective it supports.

3. Synthesize – Group results are obtained by synthesizing or combining the individual results. It is important to note that with AHP, priorities are derived rather than assigned (Forman, 2001). When synthesized, the most important projects supporting the most important objectives will have the highest relative strategic benefit (priority), with less important projects having lower relative strategic benefit.

AHP thus yields relative priorities as the foundation for considering the candidate projects for inclusion in the portfolio. These relative priorities are ratio-scale numbers; meaning that they can be accurately compared, and mathematical operations such as normalization can be performed; for example, a project with a relative priority of 0.100 is twice as important as a project with a relative priority of 0.050 in terms of achieving strategic objectives.

The result is a prioritized list of project candidates for use as input to an optimization process to derive the optimal portfolio. Once we have derived the relative strategic benefit for the candidates, we then must optimize to select the combination of projects with the highest total benefit given specified funding and constraints.

Maximizing Total Strategic Benefit Using Optimization

Using the relative priorities (from AHP), we can use optimization techniques to select the optimal portfolio. When optimizing, we select the combination of projects with the highest total relative benefit, subject to various constraints. The basic steps in selecting an optimal portfolio are:

1. State what we want to maximize – in this case we want to maximize the total strategic benefit. This means we want the total relative strategic benefit of the selected projects to be as large as possible, given the specified constraints.

2. Specify the funding level – here we need to know the maximum budget allocated for this portfolio, or the maximum allowable financial investment.

3. Specify the constraints to be applied in the model. The constraints may include such elements as critical resources, balance and coverage desired across strategic objectives or buckets, risk, funding pools, and any custom constraints desired.

4. Run the optimization model to determine the optimal portfolio under the specified conditions.

5. Define and run multiple scenarios to represent various business conditions. Some tools can produce multiple scenarios and a project portfolio adaptation of Markowitz's Efficient Frontier. Adapted for project portfolios, as suggested by Mike Gruia (2003), the efficient

frontier is a graphically displayed curve, derived from a portfolio optimization model, illustrating the best possible combinations of project portfolios, and the value (benefits) expected to be created at various levels of available funding given certain resource constraints and organizational considerations.

Selecting the *optimal* portfolio produces better results in terms of total strategic benefit than the common practice of ranking by priority and selecting down the prioritized list until funding is exhausted. Having briefly introduced these prioritization and optimization decision techniques, let's look at a typical PPM process model to see where they can be applied.

Sample PPM Process Model and Where to Apply Decision Methods

The PPM steps and life cycle can be expressed in many ways. Exhibit 1 provides one example to help visualize the process (Bible & Bivins, 2011). This sample model shows the five phases of PPM as Strategic, Screening, Selection, Implementation, and Evaluation. Other models exist, with similar concepts; e.g., the OCG in the United Kingdom, now called the Cabinet Office, identified the first three phases in our model as part of portfolio definition, and the other two phases as part of portfolio delivery (OGC, 2011).

The model illustrates key activities occurring within each phase and the ultimate output of each phase as it relates to PPM. Each phase has a major deliverable or output; e.g., the PPM output for the strategic phase is "prioritized objectives".

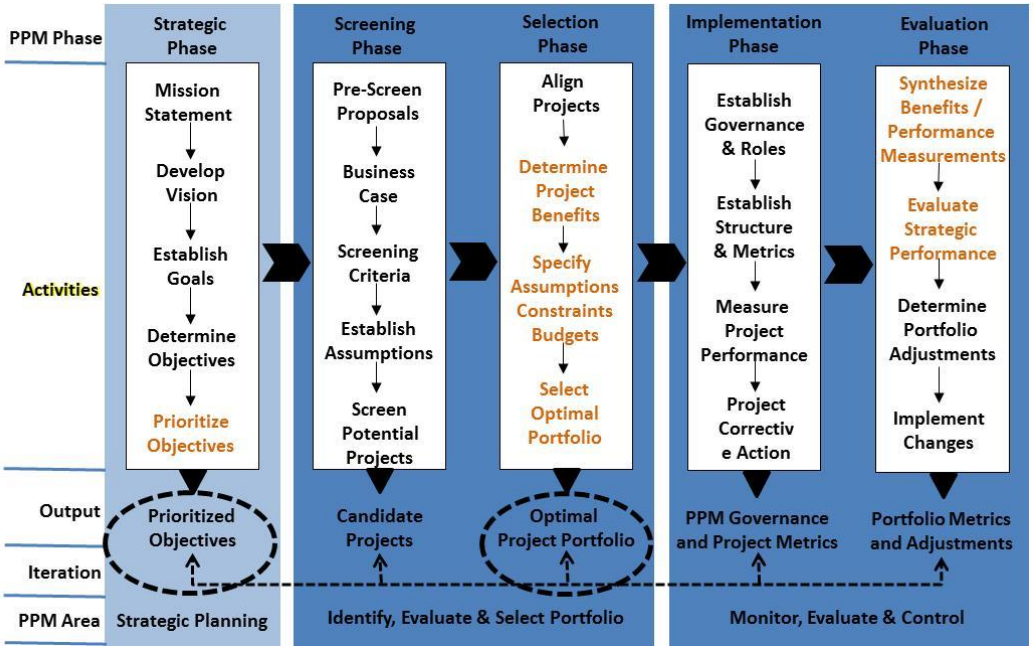


Exhibit 1. Sample PPM Model
(Adapted from Mastering Project Portfolio Management © Bivins & Bible, 2011)

Overview of Sample PPM Model

Although in the example, the phases appear to be sequential, in fact they are *highly interactive and iterative*. For example, all or part of the strategic phase is executed whenever organizational strategy changes; most organizations revisit their strategy periodically, such as annually; but also whenever internal or external conditions warrant, such as emergence of a new competitor. The critical output of this phase is a new or updated set of prioritized strategic objectives, with the ratio-scale relative priorities derived by senior management using a facilitator and a technique such as AHP.

The purpose of the screening phase is to evaluate new proposals and determine which ones warrant further definition and become candidates for consideration for the portfolio; the candidate projects are the major output of this phase, which can be executed periodically or continuously. The selection phase produces the optimal portfolio and is usually performed periodically and whenever organizational strategy changes or a promising new opportunity is introduced.

The implementation phase is performed once to establish PPM governance and metrics and then whenever necessary to adjust the processes and metrics and improve PPM maturity.

The evaluation phase is executed continuously, as performance of the portfolio and its member projects is assessed on a regular basis. The major outputs for this phase are the metrics and consequent portfolio changes. At any time, portfolio adjustments may be made based on performance of the member projects and the portfolio as a whole.

Where in the Model to Apply Decision Tools and Techniques to Maximize Strategic Benefit

In the sample model in Exhibit 1, the activities in gray (lighter) print identify the steps in the process that rely directly on ratio-scale relative benefit and optimization, and we describe each of them briefly:

Prioritizing strategic objectives is a step that is often omitted but is critical for effective portfolio selection. The strategic objectives of any organization are not of equal importance. Using AHP in this step yields the relative priorities of the objectives with respect to the overall goal of the organization.

In the selection phase, we use AHP to "Determine Project Benefits". The relative strategic benefit is determined by comparing each project supporting an objective against all other projects, and synthesizing the results as influenced by the relative priorities of the objectives they support.

Also in the selection phase we choose, with the aid of optimization tools, the combination of projects with the highest total strategic benefit given the specified budget and organizational constraints. Multiple project portfolio scenarios can be analyzed to reflect different business conditions and uncertainties during these steps.

During evaluation, project and portfolio performance results are synthesized periodically; e.g., weekly or monthly. This provides a picture of the overall health of the portfolio in relation to achieving specific objectives, as well as the performance of the individual projects. Portfolio adjustments can be made based on changes in strategy and/or project performance. As this paper is focused on portfolio selection, we do not address the evaluation topics here. For more information on these topics with respect to performance, please see Bible & Bivins (2011),

Build the Selection Decision Model Hierarchy

Exhibit 2 shows an example of a very simple selection decision model, showing the overall goal, high level objectives, and the alternatives, which in this case are the candidate projects that are mapped to the objectives they support.

Most PPM tools provide a way to enter objectives and alternatives (candidate projects) and establish their relative priorities. The objectives hierarchy can be and often is much more complex, allowing multiple levels of sub-objectives as needed. Exhibit 2 can be considered part of a strategy map – showing which projects contribute to which objectives (or sub-objectives). The business case or other nomination tool for each project must specify which strategic objectives, or sub-objectives at the lowest level of the hierarchy, are supported.

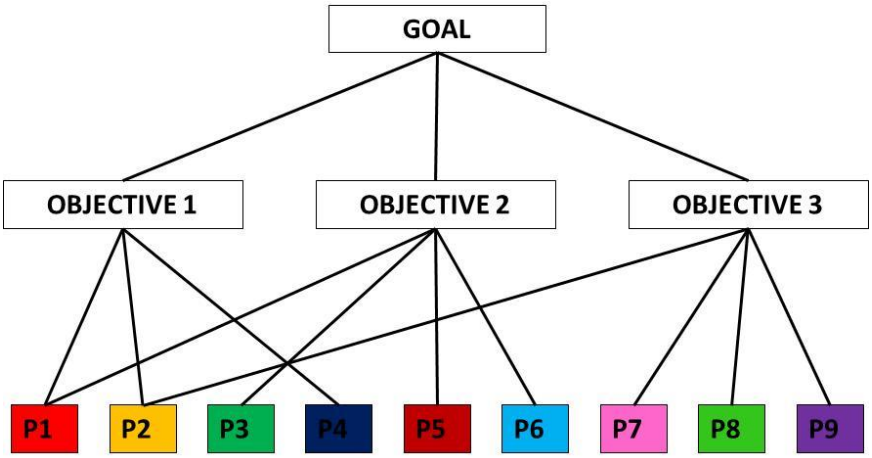


Exhibit 2. Sample Selection Decision Model -- Strategic Objectives and Supporting Project Candidates

A project can support multiple objectives; a project that does not support any objectives should not be considered. In this example, we can see that Project 1 supports both Objective 1 and Objective 2, while Project 2 supports Objectives 1 and 3, and Project 3 supports only Objective 2, and so on. Looking down from the objectives to the projects that support them, we can see that Objective 1 is supported by Project 1, Project 3 and Project 4, and so on.

Some organizations create different hierarchies for different types of projects, or strategic buckets. For example, they may have a portfolio of research projects, another portfolio of

development projects and yet another portfolio for enhancements to existing product. In these cases, they usually compare only projects or initiatives within the same category, or strategic bucket. Some organizations also remove "mandatory" projects from consideration while others include them, and their covering objectives in the process.

Prioritize the Objectives

In completing the first steps of the strategic phase of PPM, the organization has developed or revised its strategic plan with a new or updated mission, vision, goals, and objectives. Prioritizing these objectives is the responsibility of senior management – it is one of their primary ways to provide guidance for the organization to achieve its strategic objectives. Determining the relative importance of the objectives provides the foundation for selecting a portfolio of projects that, together, maximize the total anticipated benefit to the organization.

If the organization or its underlying tool employs AHP, each executive will be asked to compare the relative importance of each objective to each of the other objectives in a series of pairwise comparisons. The software will synthesize the results as in the example on this slide. In this case, in Exhibit 3 from Expert Choice Comparion™, the executives have said that Objective 1 is not only strategically the most important, but that it is more than twice as important as Objective 2. These priorities are comparable because they are ratio-scale numbers.

If the evaluators do not feel the results are intuitively correct, the facilitator can lead them to discover why not, and they can easily and productively iterate. Often, no one remembers how or why a certain decision was reached. Using this process, the results provide an audit trail. A mature organization wants such an audit trail – it documents not only the decision, but the reasons for it.

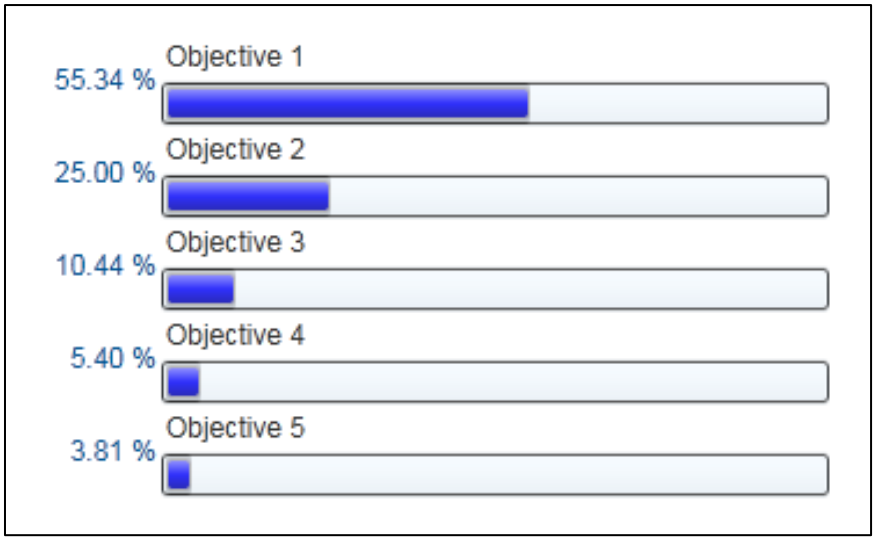


Exhibit 3. Example of Prioritized Objectives

Prioritize Candidate Projects

As opposed to prioritizing objectives, which is normally done by senior executives, prioritizing the projects may be done at a director level, or by those who understand the organization's strategy but are also intimately familiar with the project candidates and their business cases.

When this step is complete, each candidate project has a ratio-scale relative priority that represents its anticipated relative benefit to the organization with respect to achieving the goal. This priority was derived by combining (synthesizing) the participants' individual determinations of (1) the degree to which each project supports each of the objectives, compared to each of the other projects, and (2) the relative importance of the objectives as evaluated above.

Exhibit 4 from Expert Choice Comparion™ provides an example of prioritized candidate projects. From the example, it can be seen that Project 3 has the highest relative strategic benefit, and that it is considered to be about 50% more important than the next most important project, Project 9 (~ 24% versus ~ 16% of the total relative strategic benefit of the candidates). These numbers are ratio-scale and thus can be compared in a meaningful way.

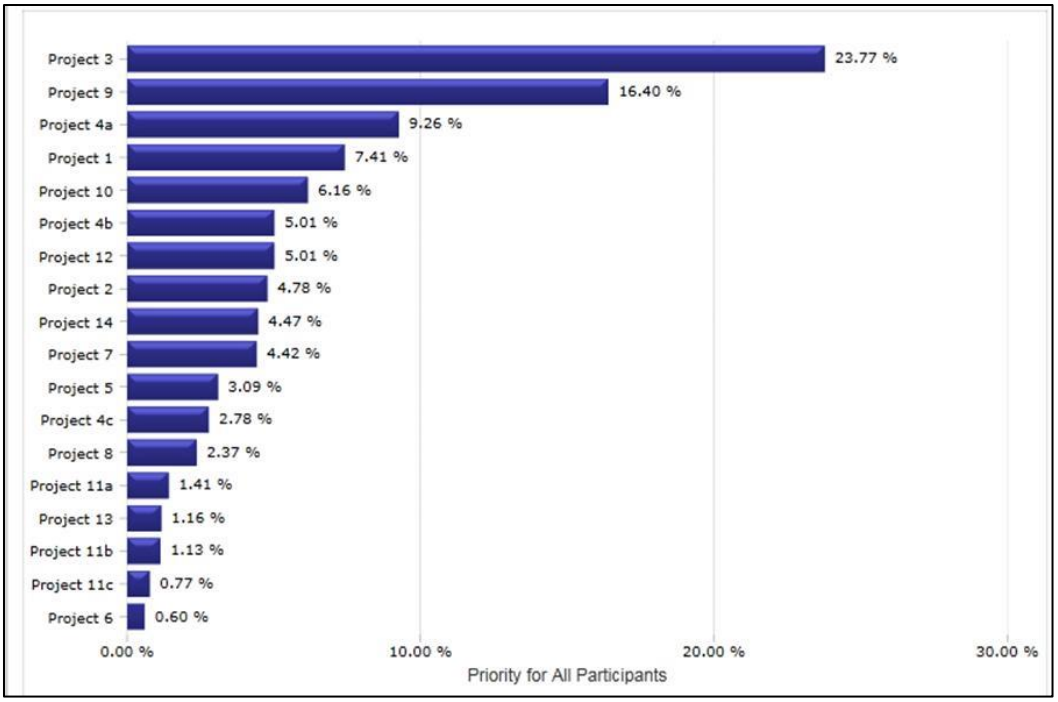


Exhibit 4. Prioritized Projects Showing Relative Strategic Benefit of Each

Iterate as Necessary

Regardless of the tools used, the evaluators' intuition and the results should agree. If they do not, the evaluators and the facilitator need to determine why and revise either the model or the evaluations until they do. The results and intuition may not agree when evaluators have different interpretations of some of the objectives or the alternatives. Perhaps they have misunderstood an

objective; for example, evaluating alternatives with high risk as preferable rather than evaluating alternatives with low risk as preferable.

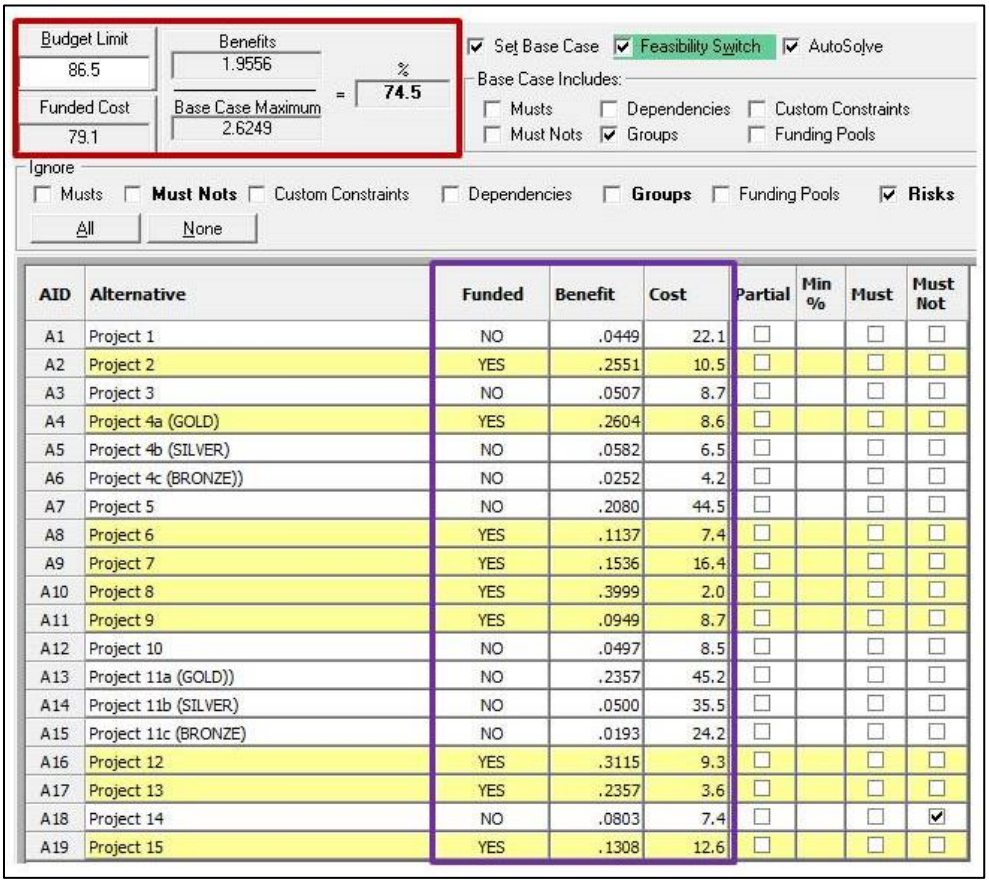
In some cases, the team may want to experiment with sensitivity analysis, which provides opportunities to play "what if" and examine how small changes in relative importance of objectives affect the outcome in terms of alternatives. Once the issues are identified and corrected, iteration is easily and quickly done.

Select the Optimal Portfolio

Once we have the list of projects with their relative priorities, we are not finished. We must then select the optimal portfolio using optimization tools. Using optimization tools produces the highest total strategic benefit; unlike the common practice of ranking by priority and selecting until funding is exhausted, which nearly always results in lower total strategic benefit. This is because optimization tools quickly analyze the possible combinations of projects and determine the combination with the maximum total strategic benefit.

Prior to performing optimization, the organization must specify funding levels, constraints, and, in some cases, risk to select the optimal combination of projects subject to those constraints; i.e. the highest total benefits given a funding level and constraints. When optimizing, we select the combination of projects with the highest total strategic benefit, subject to specified organizational constraints. The "total strategic benefit" can later provide a key input to monitoring strategic project portfolio performance. Exhibit 5 from Expert Choice Desktop™ shows an example of the output of the optimization process.

In the outlined box at the top left of Exhibit 5, the "budget limit" is set at 86.5, meaning the maximum the organization was willing to commit to this portfolio was $86.5 million dollars – a funding limit. The actual funded cost of the selected portfolio was $79.1 million dollars, yielding 74.5% of the maximum possible benefits, or a total benefit of 1.9956 out of a possible 2.6249. This number simply represents the sum of the benefits for the selected (funded) portfolio as a percent of the total benefits for all candidates considered.



AID	Alternative	Funded	Benefit	Cost	Partial	Min %	Must	Must Not
A1	Project 1	NO	.0449	22.1	☐		☐	☐
A2	Project 2	YES	.2551	10.5	☐		☐	☐
A3	Project 3	NO	.0507	8.7	☐		☐	☐
A4	Project 4a (GOLD)	YES	.2604	8.6	☐		☐	☐
A5	Project 4b (SILVER)	NO	.0582	6.5	☐		☐	☐
A6	Project 4c (BRONZE))	NO	.0252	4.2	☐		☐	☐
A7	Project 5	NO	.2080	44.5	☐		☐	☐
A8	Project 6	YES	.1137	7.4	☐		☐	☐
A9	Project 7	YES	.1536	16.4	☐		☐	☐
A10	Project 8	YES	.3999	2.0	☐		☐	☐
A11	Project 9	YES	.0949	8.7	☐		☐	☐
A12	Project 10	NO	.0497	8.5	☐		☐	☐
A13	Project 11a (GOLD))	NO	.2357	45.2	☐		☐	☐
A14	Project 11b (SILVER)	NO	.0500	35.5	☐		☐	☐
A15	Project 11c (BRONZE)	NO	.0193	24.2	☐		☐	☐
A16	Project 12	YES	.3115	9.3	☐		☐	☐
A17	Project 13	YES	.2357	3.6	☐		☐	☐
A18	Project 14	NO	.0803	7.4	☐		☐	☑
A19	Project 15	YES	.1308	12.6	☐		☐	☐

Exhibit 5. Sample Optimization Results Showing Selected Projects at the Specified Funding Level

Inside the outlined box in the center, we see the projects selected for the portfolio highlighted and with the word "YES" in the "Funded" column. In selecting this portfolio, the optimization scenario factored each project's cost and benefit against the scenario constraints to help us identify the best set of projects to undertake to achieve our strategic objectives.

Assuming this is the portfolio implemented, the organization expects to realize a total relative benefit of 1.9556 (the sum of the selected project benefits) as a result of expending 79.1 million dollars. As the projects are tied to strategic objectives and each project contributes some benefit toward achieving strategic objectives, this total benefit number represents the strategic performance baseline as well as the total relative strategic benefit in the portfolio. The actual benefit of course, is realized at some point after project completion and transition into operations.

In today's world of uncertainty, those responsible for PPM may want to, and easily can, consider multiple scenarios, with various funding levels and constraints. Using scenarios, they can select multiple portfolios, each of which represents the optimal portfolio under certain potential business conditions. Many tools also provide a look at the efficient frontier, to shown optimal portfolios at incremental levels of funding.

Accounting for Project Risk in Portfolio Selection and Performance

The decision processes described herein have used the relative strategic benefit of the project candidates to support decisions about which combination of projects are selected for the portfolio. However, many organizations want to factor risk into their portfolio decisions. They can do so by adjusting the relative strategic benefit according to project risk. Project risk of course differs from portfolio and business risk, which are not addressed in this paper.

Assessment of project risk varies from organization to organization and can range from the simple but common probability of occurrence (H-M-L) and impact (H-M-L), to a full-blown risk breakdown structure (RBS) or even an AHP model with the risk hierarchy representing the objectives and the project candidates representing the alternatives (Bible & Bivins, 2011).

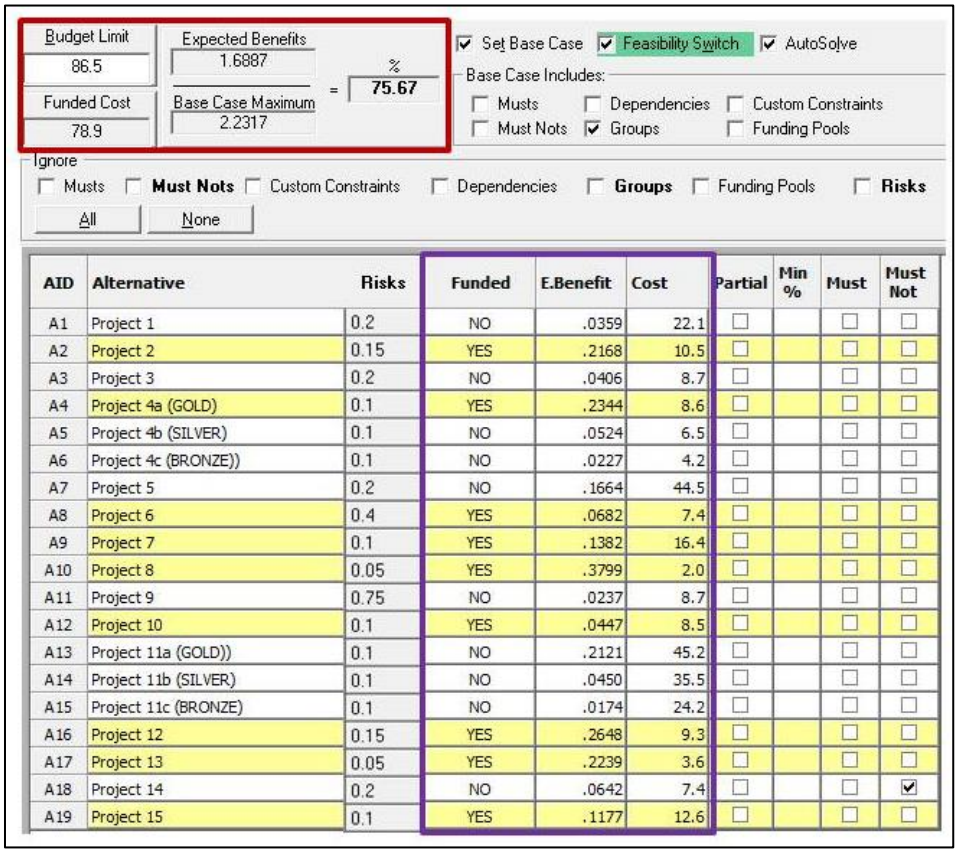
Anticipated versus Expected Benefit

When we consider only the relative priorities as evaluated, we call the result "anticipated" strategic benefit, or just anticipated benefit. When anticipated benefit is discounted by risk, we call the result "expected" strategic benefit, or just expected benefit. These two words "anticipated" and "expected" sound similar, but in this context, they are quite different.

During the lifetime of a project, changes in anticipated benefit are usually due to *changes in strategy*, while changes in expected benefit are usually due to *changes in project risk*. Project risk is closely related to achieving strategic benefit; if risk is defined as probability of failure, then it represents the likelihood that a project will not complete successfully. If the project does not complete successfully, then it won't deliver some or all of the strategic benefit for which it was selected.

Select the Optimal Portfolio Using Expected Benefit and Considering Project Risk

When organizations use project risk or probability of failure to reduce the anticipated benefit, resulting in expected benefit, the portfolio's maximum strategic benefit represents the combination of projects with the highest total expected benefit under specified constraints, rather than the highest total anticipated benefit under the same constraints, as shown in Exhibit 6.



AID	Alternative	Risks	Funded	E.Benefit	Cost	Partial	Min %	Must	Must Not
A1	Project 1	0.2	NO	.0359	22.1	☐		☐	☐
A2	Project 2	0.15	YES	.2168	10.5	☐		☐	☐
A3	Project 3	0.2	NO	.0406	8.7	☐		☐	☐
A4	Project 4a (GOLD)	0.1	YES	.2344	8.6	☐		☐	☐
A5	Project 4b (SILVER)	0.1	NO	.0524	6.5	☐		☐	☐
A6	Project 4c (BRONZE))	0.1	NO	.0227	4.2	☐		☐	☐
A7	Project 5	0.2	NO	.1664	44.5	☐		☐	☐
A8	Project 6	0.4	YES	.0682	7.4	☐		☐	☐
A9	Project 7	0.1	YES	.1382	16.4	☐		☐	☐
A10	Project 8	0.05	YES	.3799	2.0	☐		☐	☐
A11	Project 9	0.75	NO	.0237	8.7	☐		☐	☐
A12	Project 10	0.1	YES	.0447	8.5	☐		☐	☐
A13	Project 11a (GOLD))	0.1	NO	.2121	45.2	☐		☐	☐
A14	Project 11b (SILVER)	0.1	NO	.0450	35.5	☐		☐	☐
A15	Project 11c (BRONZE)	0.1	NO	.0174	24.2	☐		☐	☐
A16	Project 12	0.15	YES	.2648	9.3	☐		☐	☐
A17	Project 13	0.05	YES	.2239	3.6	☐		☐	☐
A18	Project 14	0.2	NO	.0642	7.4	☐		☐	☑
A19	Project 15	0.1	YES	.1177	12.6	☐		☐	☐

Exhibit 6. Optimal Portfolio Using Expected Benefit (Considering Project Risk)

In this case, Exhibit 6 includes a column showing the risk or likelihood of failure for each project candidate, which was used to reduce the anticipated benefit, and a column for the resulting expected benefit (E. Benefit). This time, the optimal portfolio includes Project 10, while Project 9, with high probability of failure and lower expected benefit, was not selected.

Alan Greenspan, former Chairman of the Federal Reserve of the United States, believed that risk-taking is a necessary part of creating value or wealth, and that all investments are risky (Kahaner, 2000). How organizations treat risk in portfolio selection depends in part on the nature of their business, and in part on their risk tolerance.

Summary

We have described project portfolio selection decisions as complex, requiring decision techniques like AHP to establish relative priorities, and optimization to maximize total benefit under constraints. Using AHP, we can productively and accurately derive relative strategic benefit for each candidate, thus making them comparable to one another. Optimization shows us the combination of projects, at specific budget levels and with specified constraints, that provides the greatest total benefit. With appropriate tools, we can establish and compare multiple scenarios to address various potential business environments or situations.

Such tools also allow us to measure performance of projects and portfolios for continued relevance and ability to achieve the strategic benefits for which they were selected. Since the real benefit comes after the projects or major phases are delivered to operations or the external client, organizations must adjust their portfolios to ensure they remain strategically relevant, reprioritize periodically and any time organizational strategy changes, and eliminate projects that no longer deliver strategic benefit.

The cornerstone for making portfolio selection decisions to maximize strategic benefits is a set of tools and techniques that help organizations to determine strategic benefit accurately and productively in the face of human limitations and the complex decisions required for effective PPM. This paper has endeavored to provide that foundational element.

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Susan S. Bivins, MSPM, PMP, has more than twenty-five years of management and leadership experience dedicated to delivering successful information technology, organizational change management, and professional consulting services projects for major global corporations. She specializes in project and portfolio management; international, multi-cultural and multi-company initiatives; and business strategy integration in the private and public sectors. During her career with IBM, Sue managed multiple organizations and complex projects, including operations and support for the Olympics, and a strategic transformational change program. Since retiring from IBM, she has led multi-company joint initiatives with Hitachi, Microsoft and Sun Microsystems, and served as Director of Project Management at Habitat for Humanity International. She is co-author of the book *Mastering Project Portfolio Management* (J. Ross Publishing, Inc.) and several articles on project portfolio management.

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