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Five Key Decisions for Portfolio Optimization

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Introduction

We live in an economically strapped world where it is essential for an organization to have a portfolio of successful projects. Yet General Motor's inability to make decisions about its portfolio – what cars and trucks to develop and manufacture - may lead to its bankruptcy in 2009. Things aren't much better in the IT industry where only 35% of the projects are successful (2006 *Chaos Report* from the Standish Group) with 40 - 46% late or over budget (Chaos and SAP). Furthermore, 80% of new technologies are not used as intended or abandoned within six months of implementation (Ernst & Young). Reality is probably worse than these values for IT projects, as they are based on self-reported numbers.

These statistics beg the question, Why is developing a portfolio of successful projects so hard? Although there are many responsible roles, two that are clearly important will be addressed in this paper. First, many projects that are undertaken are not aligned with the organization's strategic directions. Second, poor portfolio decisions are made. Portfolio decisions are difficult because they are based on uncertain, evolving, conflicting and incomplete information. So, these decisions are risky. For success it is essential that projects be as insensitive as possible, i.e. robust, against all that can happen after the project is begun.

Identifying these two problem areas is not new. In Chapter 7.2 of *Project Portfolio Management* (Levine 2005) Robert Cooper states (emphasis added):

*“Portfolio management is a **dynamic decision process**, whereby a business's list of active new product (and development) projects is constantly up-dated and revised. The portfolio decision process is characterized by **uncertain and changing information, dynamic opportunities, multiple goals and strategic considerations, interdependence among projects, and multiple decision-makers and locations**”*

The remainder of this paper will consider project portfolio management consistent with Cooper's quotation as a dynamic decision making process characterized by uncertainty and risk. It will spell out the five key decisions made during portfolio optimization and the fifteen questions that effort on these decisions must answer.

The paper will end with a call to action – an itemization of what is needed to fulfill the vision and the potential benefits possible.

Optimal Portfolio Management

The next generation PPM tools must help distributed teams make portfolio decisions with uncertain/changing information. Uncertainty's effect on the portfolio makes key decisions difficult. Ignoring uncertainty does not make it go away! These tools will require a change in focus from the traditional project triple constraint measures of time, cost, and content, to the portfolio triple constraint measures of strategic alignment, values/benefits, and resources/demand as shown in the Figure 1 (Levine, 2009).

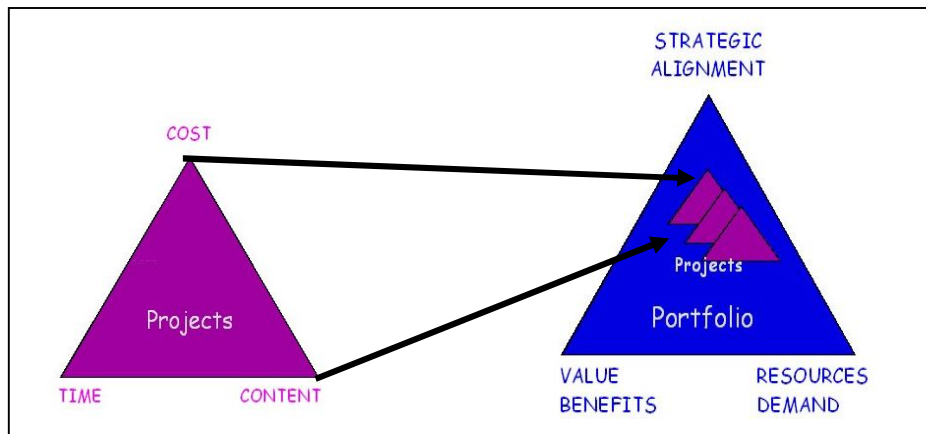


Figure 1: Portfolio Triple Constraint

It is imperative that portfolio development begins with a clear vision of the organization's strategy. This vision must be codified (not necessarily quantified as will be discussed below) in order to ensure alignment.

Benefits such as income, cost reduction, market position, etc are good measures in developing a portfolio. Unfortunately, many portfolio systems reduce all these measures to costs - a weak methodology. Often, in an effort to reduce all measures to their dollar values Net Present Value (NPV) or some other equivalent is used. There is great comfort in having a single dollar value for each project, but, is this value sufficient for actually committing resources? Using only NPV has the following weaknesses (Ullman 2009):

- The accuracy of the data is suspect (sometime off by an order of magnitude (Cooper 1998)); using a single indicator of project value only combines inaccurate estimates, thus compounding the error.
- Risk estimates are added to NPV and are often no better than pulling numbers out of the air, compounding the error further.
- NPV penalizes projects with longer-term launch dates.
- NPV assumes that risk (uncertainty) is spread out evenly over the life of a project, which is often not true.
- Measuring everything in terms of dollars is foolhardy. Much information is lost is trying to fit everything into one measure.

Thus, a wide range of measures that capture; strategic fitness, sponsorship metrics, and value need to be established.

It is equally important to identify critical resources up front since we must be careful and frugal in how we commit critical resources so that they are allocated to the most advantageous projects. Detailed load leveling of less critical resources can be delayed until the better projects are selected.

Risk

Risk is a combination of what can go wrong; its probability; its impact and its potential for mitigation. For support of recurring projects risk can be based on data from previous projects, but for new work a majority of the risk is due to uncertain estimations (Ullman 2008, Ullman 2006).

To demonstrate how big a risk uncertain estimates create, consider a simple experiment that has been run many times as part of presentations - the results given here are typical. A group is given a list of dirty dishes and asked to estimate how long it will take to clean up the stack. For one audience, the mean estimate was 32 minutes with a standard deviation of 10 minutes (these are typical results). For this data the standard deviation is nearly 1/3 of the mean time. Compounding these results is that simple changes in the wording of the problem, changes the mean by as much as 100%. Here, for a very simple, everyday problem, the time estimates vary with who is asked and how they are asked. Portfolios are based on many project estimates. Think how much uncertainty there is in these estimates for time, cost, and performance for new or technically challenging projects. It is these estimates which are the largest causes of portfolio risk. In the process developed in the following sections, estimation uncertainty is critical at many of the decision points.

This discussion begs the question, "How can I manage this uncertainty?" Some suggestions are:

- Collect estimates from more than one independent source.
- Do not ignore the ones that are worse than what you want to hear. In other words, don't kill the messenger.
- Develop portfolios based on worse case information. Do not rely on traditional sensitivity analysis after the portfolio is formed. This is not sufficient (see Decision 5 below).
- Make use of software specifically designed to manage uncertain estimates (see link to *Accord* software in references) if available.

The Portfolio Optimization Process

With the above foundation we can explore the five key decision points in developing a robust portfolio. These are shown as D1 – D5 in the portfolio optimization process in Figure 2.

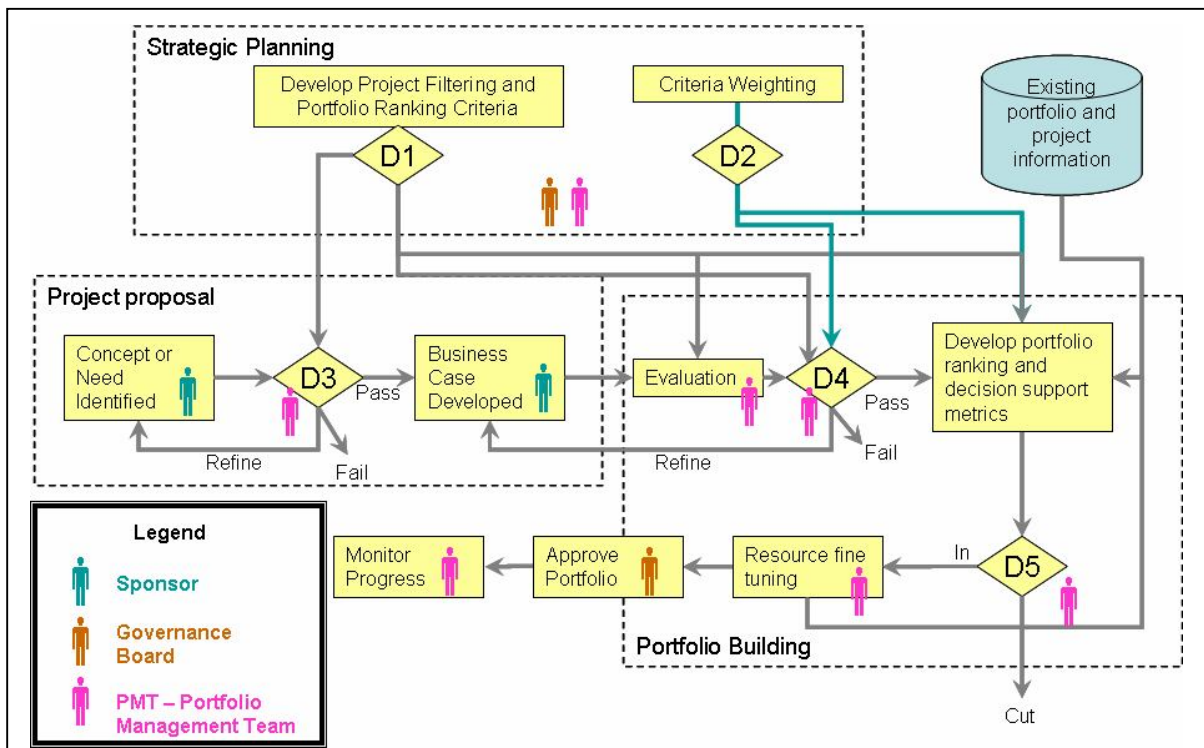


Figure 2: The Portfolio Optimization Process

Before describing the five decision points shown in the process (e.g. D2), the stages and responsible roles will be briefly defined.

The Stages

There are three primary stages to Portfolio Optimization Process shown as dashed boxes in the flow chart.

- **Strategic Planning:** - drives criteria development and importance weighting thus developing the measures for the organization's success.
- **Project Proposal:** - project sponsors develop business cases for ideas, opportunities, and needs.
- **Portfolio Building:** - proposed projects are chosen for funding and resource allocation.

Most PPM systems concentrate on the last stage, but decisions D4 and D5, those made during this stage can only be as good as the decisions made earlier. Also, shown in Figure2, after Portfolio Building, progress must be monitored as portfolio optimization is dynamic. In actuality, monitoring is a reiteration of the activities and decisions in portfolio building.

The Responsible Roles

There are three primary responsible roles shown in Figure 2:

- **Governance Board (GB):** - managers of the strategic vision and representatives of the executives responsible for operations and business success.
- **Portfolio Management Team (PMT) or Portfolio Management Office (PMO):** - managers of the portfolios of projects. These responsibilities may be divided into two groups as shown here or GB and PMT functions may be provided by one group.
- **Project Sponsor:** - the person and organization proposing the project.

The Decisions

With this foundation we can now visit the five key decisions needed for portfolio optimization. Here each decision is defined in terms of the expected outcome, what is delivered by the decision. Each decision answers a number of key questions that need to be addressed. These are itemized within each decision.

Decision D1: Decide what strategic initiatives, benefits, and resource limitation criteria (i.e. measures) to use for project filtering and portfolio ranking.

The GB or GB+PMT must identify strategic initiatives and resource limitations. Strategic initiatives (i.e. goals/objectives, business drivers) reflect the organization's strategic plans. Criteria must be developed to reflect strategic fitness, sponsorship measures, fit with strategic resources, value and risk. These measures may be expressed as a mix of qualitative, quantitative, and N-point scales. As examples:

1. Is this project aligned with core competencies? (Yes or No - qualitative)
2. What is the project's NPV? (value - quantitative)
3. How well does a project support strategic initiatives? (very well; well' average; not so well; poorly - a 5-point scale).

Strategic resource limitations reflect critical cost, expertise, facilities or times that limit projects in the portfolio. These are often first addressed as a resource leveling activity (after Decision D5 in Figure 2), but this should only be a fine tuning as critical resources need to be identified up front and play an active role in portfolio building.

Where the strategic initiatives are fairly static, resource limitations will change with time.

Decision 1 helps the GB and PMT answer the first two of the fifteen questions:

1. What are our resource objectives?
2. What are our critical resource limitations?

Decision D2: Decide which criteria are most important to achieve.

The strategic initiatives and resource limitations must be weighted by the GB or GB+PMT to reflect the organization's values. This weighting and the sensitivity to it are critical during the portfolio optimization. Weightings control crucial tradeoffs made during portfolio optimization.

Decision helps the GB and PMT answer the question:

3. What do we think is most important?

Decision D3: Decide which project ideas or needs are worth developing into business cases?

Business case development is a two stage process. Before approval to develop a full business case, the concept or need is identified and presented by the Sponsor to the PMT. The objective here is a quick filtering and advice back to the sponsor for improvement before time and effort is spent developing a full business case. Sponsors for promising projects that are not approved for business case

development should be given details for needed refinement. The decision here, and at D4 are either pass, fail or advise.

This effort must answer the question:

4. Which ideas and needs are worth developing into business cases?

If approved, a full business case is developed by the Sponsor. The important information to be developed in the case is guided by the strategic initiatives and resource limitation criteria (D1) and their importance weighting (D2). For each ranking and selection criteria, the data supplied must capture uncertainty and risk. For example, if a strategic initiative is “time to market less than 6 months”, then the Sponsor should give the best estimate for the time to market along with the optimistic and pessimistic estimates, and the justification for each estimate. The business case must also contain information on inter-dependencies with other existing or proposed projects.

The business case must answer the following questions:

5. What strategic initiatives does this project support?
6. Does the value equation, fully consider all uncertainty and risk?
7. What are the inter-project dependencies?
8. Why we doing this project?

Decision D4: Decide which Business Cases should be considered as part of the portfolio

Based on information supplied by each sponsor, the PMT evaluates business cases. Multiple heads review each case and score it versus the evaluation criteria. Scoring is based on the information in the business case filtered by the knowledge and experience of each of the PMT evaluators. For example: the sponsor may give high, low, and most likely estimates for the time to develop a product. Each evaluator will have experience and knowledge that may alter these estimates.

A Portfolio decision optimization system should be able to support the PMT and manage the scoring by:

- Fusing the PMT evaluations even when they do not agree
- Identifying for the PMT any areas where lack of consensus in the evaluation of criteria might have an impact on the portfolio. If lack of consensus will not affect the results, no action is identified.
- If the business case is not selected for inclusion, then identify for the sponsor those areas which, if resolved might lead to passing this gate.

- Identify any areas of uncertainty or evaluation lack of consensus that may affect Decision D5.

Decision 4 will help the PMT answer:

9. Which business cases should be considered for inclusion in the portfolio?
10. What are the key risk areas for each project?

Decision D5: Decide which projects to include in the portfolio

This is the major decision in project portfolio optimization. The goal is a ranking of projects ordered by ability to meet the strategic initiatives and resource limitations, and respective of inter-project dependencies. The analysis that underlies this ranking must take into account all uncertainties and inconsistencies in the evaluation of the business case. Traditionally, this ranking has been accomplished using deterministic information, and then the effect of uncertainty added by doing a sensitivity analysis after the ranking. There is strong evidence, in engineering literature that this is a weak approach. Uncertainty must be considered from the beginning.

The results of analysis that supports this decision must provide the PMT with the rank of each project in the portfolio; the effect of uncertainty on the rank; identification of information in the estimates that, if refined, could change the status in the ranking; and the portfolio risks. A support tool must give the PMT the ability to explore forcing projects in/out of the portfolio, the sensitivity to resource constraints and the sensitivity to priority changes (weightings).

For projects that fall on the boundary between inclusion and exclusion, the identification of what needs to change for inclusion should be part of the analysis. This gives the PMT a clear indication about what to do next to make a learned decision about them that may include gathering more information, discussing difference of opinion about specific and identified factors or performing what if analyses.

Decision 5 helps the PMT answer the following questions:

11. Which current projects and proposed new projects should be in the portfolio?
12. Will a project cause excessive multi-tasking, or delay other critical work?
13. What are the key risk areas for each portfolio?
14. What areas of uncertainty endanger the realization of benefits?
15. Why are we doing this (any specific) project?

As shown in Figure 2, subsequent to decision five, the Governance Board must approve the portfolio and the PMT must monitor progress. As stated before, monitoring is really a replaying of the activities and decisions in portfolio building.

A call to action

At the end of 20th century, industry and business became aware of the importance of processes. In the 21st century they are becoming aware that it is the decisions within the process that are critical. Portfolio decisions in particular are predicated on information that is uncertain, incomplete, evolving, and conflicting. Ignoring these factor leads to poor decisions. It is the fusion of this information from many, possibly distributed stakeholders representing different business functions and viewpoints about what is important that is central to a successful portfolio. Further, the success of portfolio decisions depend on a structure that helps the stakeholders develop, share, and disagree about important information. This process must take into account that people and situations demand a variety of decision making styles.

Current PPM systems are not decision-centric, ignore uncertainty for the most-part, and do not support all the decisions itemized in this paper. A total of fifteen questions have been exposed in the five decisions. A system that can help the GB, PMT and sponsors answer these questions and can provide the needed capabilities must:

- Provide structured data models to drive consistency
- Support a dynamic decision support environment
- Provide an analytical capability that supports both qualitative and quantitative uncertain estimates of performance and resources
- Provide a repeatable model that can be used uniformly on projects or portfolios of projects
- Provide a clear picture of strategic resource impacts
- Support real-time, what-to-do-next and what-if analyses
- Be able develop a portfolio that is consistent with the strategic plans and resource limitations
- Be easily used and managed by governance board, PMT and project sponsors
- Provide uncertainty management and risk metrics
- Provide decision metrics that guide portfolio development
- Be flexible so organizations can add features as their PPM processes mature.

These capabilities can all be accomplished using a set of state-of-the-art, uncertainty-based decision support methods (Accord software) integrated into a PPM framework. Such methods, in support of the processes described in Figure 2, will add value each step of the way, leading to building sound, supportable portfolios, aimed at maximizing the benefits from limited, critical resources. If using such a process and methods can facilitate increased recognition of risk and uncertainty, help build better business cases, and improve the decision-making process needed for quality portfolio building, the payback from your investment will be significant and rapid.

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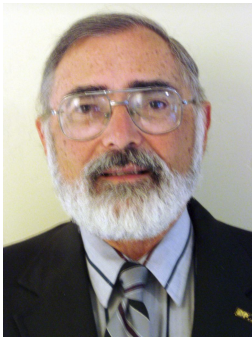
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Dr. David Ullman, has a unique history of teaching, research and professional practice. He has taught the design process to over 1000 students in university classrooms and at over twenty major corporations. He has written what is considered to be the best text on the design process. He has founded two successful corporations and developed products for them. He has a reputation for designing simple solutions to problems and believes that in simplicity is elegance. Throughout his career he has strived to practice what he preaches, and preach what he has personally researched and used in practice. He is the Author of *The Mechanical Design Process* 4th edition, McGraw-Hill, 2009 and *Making Robust Decisions*, Trafford, 2006. He serves as the President, Robust Decisions Inc, a company helping clients make decisions by design. He is an Emeritus Professor of Mechanical Engineering Design at Oregon State University, a Fellow of the American Society of Mechanical Engineers (ASME) and developer of Accord, the software enabler of robust decision-making. David can be contact at ullman@robustdecisions.com.

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