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PORTFOLIO MANAGEMENT IN NEW PRODUCT DEVELOPMENT: LESSONS FROM LEADING FIRMS-- Part II

by

R. G. Cooper, S. J. Edgett, E. J. Kleinschmidt

Innovation Research Working Group
WORKING PAPER NO. 61

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Abstract

This article, the second in a two part series, presents the results of an investigation into portfolio management practices: how leading firms manage their R&D portfolios; and insights and our recommendations for your company in order to achieve a higher return from your R&D investment.

The article begins by discussing the linking of the portfolio to the business's strategy. This is followed by a look at the 10 top unresolved issues and barriers yet to be overcome by many firms attempting to implement a portfolio management system in their companies. The paper concludes with a recommended portfolio management process.

About the Authors

Dr. Robert G. Cooper is a world expert in the field of new product management, and has been labeled “the quintessential scholar” in the field of new products in the U.S. publication, *Journal of Product Innovation Management*. He is the Lawson Mardon Chaired Professor of Industrial Marketing and Technology Management at Michael G. DeGroote School of Business, McMaster University in Ontario, Canada.

Bob is considered to be the father of the *Stage-Gate process*, now widely used by leading firms around the world to drive new products to market. His NewProd series of research -- an extensive investigation over the last 20 years into the practices and pitfalls of product innovation in hundreds of companies and over 1000 new product projects -- has been widely cited. He has published more than 75 articles and four books on new products, including the popular, “Winning at New Products: Accelerating the Process from Idea to Launch”.

Bob’s dynamic talks have captivated thousands of business people in North America, Europe and the Pacific. He has consulted in the field of new product management for leading companies worldwide, including: IBM, Proctor & Gamble, Exxon Chemicals, DuPont, BP (UK), Courtaulds (UK), SC Johnsons Wax, Shell-Wavin (Netherlands), Kodak, WR Grace, Corning, Hallmark, Northern Telecom, Lego, Emerson Electric, BF Goodrich, Polaroid, the Royal Bank of Canada, Pfizer, Carlsberg Breweries, Rohm & Haas, Hoechst (US), US West, Bell-Canada, and Reckitt & Colman (UK&US). Many of these companies have implemented his Stage-Gate approach to accelerating new products to market.

Bob holds Bachelors and Masters degrees in Chemical Engineering, an MBA, and a PhD in Business.

Dr. Scott J. Edgett is an internationally recognized expert in the field of new product development and portfolio management. He is an Associate Professor of Marketing at the Michael G. DeGroote School of Business, McMaster University, Ontario, Canada and Director of the Product Development Institute.

Scott is a noted speaker and consultant having conducted executive seminars and consulting projects in Canada, United States and England. Some of his recent clients include Amoco, Avery Dennison, CMHC, Dofasco, DowElanco, E.B. Eddy Paper, Hallmark, ISK Biosciences, Gennum, ICI, John Hancock Mutual Life, Manulife Financial, The Mutual Group, Nova Chemicals, NYNEX Information Resources, Reynolds Metals Company, Rohm & Haas, The Royal Bank of Canada, Xerox, and Zeneca Pharmaceutical.

He has considerable expertise as a researcher into the factors that make successful new products, and as a consultant to companies seeking to improve their new product processes and/or improve their approaches to portfolio management. He has published more than 40 articles and papers, including the "Best Practices" series.

Scott holds a Bachelor of Business Administration in Accounting, an MBA in Marketing/Finance and a Ph.D. in Marketing (New Product Development).

Dr. Elko J. Kleinschmidt is a leading expert on the process of new product development and international factors that influence new product development outcomes. He is a Professor of Marketing and International Business and Director of the Engineering and Management Program at McMaster University.

He is a recognized researcher in the field of new product development, innovativeness and the impact of the international dimension on new products. He has over 30 publications including articles and booklets.

Elko has international experience working in Europe, North America and Africa. He has presented numerous seminars to companies in North America, Europe, Asia (China) and Australia primarily in the area of new product development and marketing.

His consulting activities have included market forecasts, new product aspects and developing new product processes for companies.

Elko holds a mechanical engineering degree, an MBA and a Ph.D in Business Administration. His practical work experience includes engineering tasks, investment analysis for technical projects and technical marketing.

Portfolio Management in New Product Development: Lessons from Leading Firms - Part II

Up-Date

In Part I of this two-part series, the authors of this study into portfolio management introduced the key issues uncovered, defined what portfolio management is, and outlined the three goals of portfolio management. They then described methods they found in use in leading firms that were designed to achieve the first two goals, namely *maximizing the value* of the portfolio, and achieving the *right balance* of projects. Part II continues, with a look at the final goal, namely achieving the necessary link between portfolio management and business strategy, moves to identifying the unresolved issues and problems in portfolio management, and finally proposes some solutions and a recommended approach.

Goal # 3: Building Strategy Into the Portfolio

Strategy and new product resource allocation must be intimately connected. Strategy begins when you start spending money! Until one begins allocating resources to specific activities - for example, to specific development projects - strategy is just words in a strategy document. These were the views shared by enlightened management of several of the companies investigated.

The mission, vision and strategy of the business is made operational through the decisions it makes on where to spend money. For example, if a business's strategic mission is to "grow via leading edge product development", then this must be reflected in the number of new product projects underway - projects which will lead to growth (rather than simply to defend) and projects that really are innovative. Similarly, if the strategy is to focus on certain markets, products or technology types, then the majority of R&D spending must be focused on such markets, products or technologies.

Not every company we studied had achieved proficiency here. For example, one business unit's senior executive claimed that "my SBU's strategy is to achieve rapid growth through product leadership"; yet when we examined his SBU's breakdown of R&D spending, the great majority of resources was going to maintenance projects, product modifications and extensions. Clearly this was a case of a disconnect between *stated strategy* and *where the money* is spent. His business was not alone!

Linking strategy to the portfolio: approaches

Two broad issues arise in the desire to achieve *strategic alignment* in the portfolio of projects:

- ▶ *Strategic fit*: The first is: are all your projects consistent with your business's strategy? For example, if you have defined certain technologies or markets as key areas to focus on, do your projects fit into these areas - are they in bounds or out of bounds?
- ▶ *Spending breakdown*: The second is: does the breakdown of your spending reflect your strategic priorities? That is, if you say you are a growth business, then the majority of your R&D spending ought to be in projects that are designed to grow the business. In short, when you add up the areas

where you are spending money, are these totally consistent with your stated strategy?

Two general approaches to achieve strategic alignment were observed in some companies we studied:

1. *Building strategic criteria into project selection tools*: here strategic fit was achieved simply by incorporating numerous strategic criteria into the Go/Kill and prioritization models; and
2. *Top-down strategy models*: these began with the business's strategy and then moved to setting aside funds - envelopes or *buckets of money* - destined for different types of projects.

Strategic criteria built into project selection tools

Not only are scoring models effective ways to maximize the value of the portfolio, they can also be used to ensure strategic fit. One of the multiple objectives considered in a scoring model, along with profitability or likelihood of success, can be to *maximize strategic fit*, simply by building into the scoring model a number of strategic questions.

An illustration:

In the scoring model used by Hoechst (Exhibit 3 in Part I of this article), two major factors out of five are strategic; and of the 19 criteria used to prioritize projects, six, or almost one-third deal with strategic issues. Thus, projects which fit the firm's strategy and boast strategic leverage are likely to rise to the top of the list. Indeed, it is inconceivable how any "off strategy" projects could make the active list at all: the scoring model naturally weeds them out.

Another illustration:

R&C subjects all projects at gate meetings to a list of Must criteria before any prioritization consideration is given. At the top of this Must Meet list is *strategic fit*: Projects which fail this criterion are knocked out immediately. Next a set of Should Meet criteria is used via a scoring model; unless the project scores a certain minimum point count, again it is knocked out. Embedded within this scoring model are several strategic direction criteria. Finally, in R&C's bubble diagram (where *concept attractiveness* is plotted versus *ease of implementation* - see Exhibit 6 in Part I), of the six parameters which make up *concept attractiveness*, two capture important strategic directions - ability to build the brand and franchise; and geographic scope. Thus R&C builds strategic fit and direction in throughout its scoring and bubble diagram portfolio approaches.

Top down strategic approaches

While strategic fit could be achieved via a scoring model, a top down approach is the only method we observed designed to ensure that the eventual portfolio of projects *truly reflects* the stated strategy for the business: that where the money is spent mirrors the business's strategy. There were several variants of this approach.

Strategic Buckets Model

This top down method operates from the simple principle that *implementing strategy equates to spending money on specific projects*. Thus, setting portfolio requirements really means "setting

spending targets”. A number of firms studied used bits and pieces of this approach, and what we describe below is a composite across several companies.

The method begins with the business’s strategy, and requires the senior management of the business to make forced choices along each of several dimensions - choices about how they wish to allocate their scarce money resources. This enables the creation of “envelopes of money” or “buckets”. Existing projects are categorized into buckets; then one determines whether actual spending is consistent with desired spending for each bucket. Finally projects are prioritized within buckets to arrive at the ultimate portfolio of projects - one which mirrors management’s strategy.

Here are the details: Management first develops the vision and strategy for the business (or SBU). This includes defining strategic goals and the general plan of attack to achieve these goals - a fairly standard business strategy exercise. Next, they make forced choices across key strategic dimensions. That is, based on this strategy, the management of the business allocates R&D resources (either in dollars or as a percent) across categories on each dimension. Some dimensions which we witnessed included:

- *Strategic goals*: management is required to split resources across the specified strategic goals? For example, what percent (or how many dollars) should be spent on Defending the Base; on Diversifying; on Extending the Base? and so on.
- *Product lines*: resources are split across product lines: e.g., how much to spend on Product Line A? On Product Line B? On C? A plot of product line locations on the product life cycle curve was used in one firm to help determine this split. Rhode & Schwarz, a sizable German electronics and instruments firm, uses a scoring model to allocate resources across product lines.
- *Project type*: what percent of resources should go to new product developments? To maintenance-type projects? To process improvements? To fundamental research? etc. One SBU within Exxon Chemicals used the standard *product/market newness* matrix proposed by Booz-Allen to visualize this split [1]. Here, the six different types of projects defined on this matrix each received a certain percentage of the total budget.
- *Familiarity Matrix*: what should be the split of resources to different types of markets and to different technology types in terms of their *familiarity to the business*? Both Dow Corning and Eastman Chemical use variants of the “familiarity matrix” proposed by Roberts - technology newness versus market newness - to help allocate resources [2].
- *Geography*: what proportion of resources should be spent on projects aimed largely at North America; at Latin America; at Europe; at the Pacific? Or at global?

Now, management develops *strategic buckets*. Here the various strategic dimensions (above) are collapsed into a convenient handful of buckets. For example, buckets might be

- Product Development Projects for Product Lines A & B;
- Cost Reduction Projects for all products;
- Product Renewal Projects for Product Lines C & D;

and so on (see Exhibit 8). Next, the desired spending by bucket is determined: the “*what should be*”. This involves a consolidation of desired spending splits from the strategic allocation exercise above.

Next comes a gap analysis. Existing projects are categorized by bucket and the total current spending by bucket is added up (the “*what is*”). Spending gaps are then identified between the “*what should*

be” and “*what is*” for each bucket.

Finally, projects within each bucket are rank ordered. Companies used either scoring models or financial criteria to do this ranking within buckets (Exhibit 8). Portfolio adjustments are then made, either via immediate pruning of projects, or by adjusting the approval process for future projects.

The major strength of the Strategic Buckets Model is that it firmly links spending to the business’s strategy. Over time, the portfolio of projects, and the spending across strategic buckets, will equal management’s desired spending levels across buckets. At this point, the portfolio of projects truly mirrors the strategy for the business.

Another positive facet of the strategic buckets model is the recognition that *all development projects which compete for the same resources should be considered in the portfolio approach*. For example, product development projects must compete against cost reduction projects, because both utilize R&D resources.

Finally, different criteria can be used for different types of projects. That is, one is not faced with comparing and ranking very different types of projects against each other - for example, major new product projects versus minor modifications. Because this is a two step approach - first allocate money to buckets, then prioritize like projects within a bucket - it is not necessary to arrive at a universal list of scoring or ranking criteria that fits all projects.

The major weakness of the approach is the burden it places on senior management of the business: this is a very time-consuming, arduous exercise. Further, making forced choices on resource splits, in the absence of consideration of specific projects, may be a somewhat hypothetical exercise.

StratPlan or Strategic Check

This method is similar, in that it begins with the business’s strategy, and develops a strategic mission for each business. But it tends to be more of an “after-the-fact” model - a check or correction designed to bring the portfolio back closer to the strategic ideal. Thus, instead of deliberately setting up buckets of resources, as in the Strategic Buckets Model above, this method simply begins by developing a complete portfolio ranking of all projects - for example, using a traditional maximization method (scoring model or financial criteria); and *then checks* to see that the resulting list of projects indeed is consistent with the business’s strategy. The method is similar to the Strategic Buckets Model, except that it reverses the order of steps.

An illustration:

The strategic planning exercise used within one division of Royal Bank (RBC) is fairly typical. Like Hoechst, RBC uses a scoring model to rate and rank projects. One check that the firm has built into its scoring technique to ensure that project spending is linked to strategy is their “StratPlan” exercise.

StratPlan is a macro level, *strategic planning exercise* whereby the 12 Product Groups in RBC are analysed via a strategic portfolio exercise, resulting in missions and macro-strategies for each of

the Groups. StratPlan scores these 12 Product Groups and classes them according to a McKinsey-style grid. This *macro strategic exercise* is a fairly traditional one, but worth mentioning here because of the way in which it is tied into new product spending and RBC's scoring model.

Independently, new product projects are scored and rank ordered via a scoring model, much like Hoechst's method in Exhibit 3. The cut-off point on the rank-ordered list is the point where total spending equals the total budget: all projects above this cut-off line are a "first cut Go". This list of Go projects is then broken down by Product Group, and the total proposed expenditures by Product Group are determined. These totals, as a percentage of revenue, are next compared across Groups, seeking inconsistencies with each Product Group's macro strategy. Gaps are identified between new product spending levels per Product Group versus the desired spending. For example, if a Product Group were classified as a "maintain and defend" business, yet received a rather large percentage of product development spending via the scoring model, a gap exists. A second round of project prioritization ensues, with some projects which originally had been "Go" now removed from the list. This moves the portfolio closer to the one dictated by the StratPlan exercise. Several rounds are required before the final list of Go projects are agreed to: at this point, the prioritized list contains very good projects, according to the scoring model; and the spending allocations correctly reflect the various strategies and missions of each Product Group.

This StratPlan exercise resembles the Strategic Buckets Model in that desired spending levels per area (in this case, by Product Line Group) are decided, gaps identified, and the portfolio of projects arranged accordingly. However, the method reverses the order of steps (projects are prioritized first, and then checked for consistency with strategy after), is somewhat easier to implement, and is less demanding on management.

Where We Stand

Thirty years of development, and are we any further ahead? The answer is clearly yes! At worst, we've discovered *what does not work* in portfolio management. More positively, some companies are very close to a solution that works for them. But there remain many unresolved issues and barriers yet to be overcome in portfolio management.

1. Portfolio management is a vital issue

The portfolio management question is a *very important one* ... perhaps more important than we had previously judged. If the amount of time and money that these and other companies have spent on the problem is any indication, then portfolio management and project selection is likely the *number one issue in new product development* and technology management for the next decade, and may even be in the top three strategic issues faced by today's executives.

Portfolio management is critical for at least three reasons, according to companies interviewed:

- First, a successful new product effort is *fundamental to corporate success* as you move into the next century. More than ever, senior management recognizes the need for new products ...

especially the right new products. This logically translates into portfolio management: the ability to select today's projects which will become tomorrow's new product winners.

- ▶ Second, new product development is the *manifestation of the business's strategy*. One of the most important ways you operationalize strategy is through the new products you develop. If your new product initiatives are wrong - the wrong projects, or the wrong balance - then you fail at implementing your business strategy.
- ▶ Third, portfolio management is about *resource allocation*. In a business world preoccupied with value to the shareholder and doing more with less, technology and marketing resources are simply too scarce to allocate to the wrong projects. The consequences of poor portfolio management are evident: you squander scarce resources on the wrong projects, and as a result, starve the truly meritorious ones.

2. No magic solution

There is no magic answer or *black box model* to solve the portfolio management challenge. Indeed the firms we witnessed, in spite of expensive and extensive attempts to develop such portfolio models, were quick to admit that there was no single right answer here, and that they were still actively seeking solutions and making improvements to their own approaches.

Not only is there no magic answer, there isn't even a *dominant approach*! In spite of the fact that many of these managements had read the same reports, articles and books, had benchmarked against the same firms, and had even hired the same consultants, the approaches they arrived at for their own companies were quite different from each other. There is no universal method, dominant theme or generic model here; rather the models and approaches employed were quite firm specific.

A great variety of concepts, tools and approaches were employed by these leading firms. The most popular were sophisticated variants on *scoring models* and *financial value models*, and also various *portfolio mapping* approaches, such as bubble diagrams. Some progressive firms used a hybrid approach - a combination of approaches which looked at both the issues of *balancing the portfolio* as well as *maximizing the value of the portfolio against certain objectives*.

There was no evidence at all of the use of (or interest in) mathematical programming and optimization techniques. Ironically, such models were very common in the literature, but had rarely been implemented or tested in industry. Indeed the notion of a "black box decision model" which would yield a prioritized list of projects had been rejected by all firms studied; rather a *decision tool* or *decision support system* designed to help managers make the decision was the preferred route.

3. No "flavor of the month" solutions

The problem is far from solved. Many of the models we observed in companies, although elegant and comprehensive, were as yet relatively untested. These are largely new approaches being implemented only now in these firms. No doubt there will be years of work to be done before well-accepted portfolio models and methods are common-place in industry.

Specific Conclusions Regarding Effective Portfolio Management

1. There are three main goals in portfolio management

- ▶ *Maximizing the value of the portfolio* against an objective, such as profitability. Here financially-based methods (such as ECV or the Productivity Index) and scoring models (which built the desired objectives into the criteria list) were most effective.
- ▶ *Balance in the portfolio*: portfolios can be balanced in terms of numerous dimensions; the most popular were risk versus reward; ease versus attractiveness; and breakdown by project type, market and product line. Visual models, especially bubble diagrams, were thought most appropriate to portray balance.
- ▶ *Link to strategy*: strategic fit and resource allocation which reflects the business's strategy were the key issues here. Scoring models, strategic buckets, and strategic checks are appropriate techniques.

Of the three, no one goal seemed to dominate; moreover, no one portfolio model or approach seemed capable of delivering all three goals.

2. Integration between gate decisions and portfolio decisions

All the companies we studied relied on some type of new product process model, such as stage-gate™, to drive new products from idea through to market. Embedded within these processes are gates or Go/Kill decisions points - points where the project is reviewed before moving to the next stage. The gates are resource allocation decisions, where the senior decision-makers or "gatekeepers" make Go/Kill and prioritization decisions on individual projects.

The potential for conflict exists between this gating decision process and portfolio reviews, namely:

- ▶ real time decisions made on individual projects at gates; versus
- ▶ portfolio decisions made periodically, but on all projects together.

These are two different decisions processes (and in some firms, even involved different people and somewhat different criteria!); yet both purport to select projects and allocate resources, hence the potential for conflict arises. For example:

- ▶ Portfolio decisions consider all projects together - a comparison against one another. This holistic view is healthy, but it does limit the amount of time the decision-makers can spend on any one project. By contrast, gate decisions tend to focus on one project: that one project receives a rather thorough management review, but in relative isolation from the other projects.
- ▶ Gate decisions occur in real time - as the project moves from one stage to the next; by contrast, portfolio review meetings are held in calendar time perhaps annually, semi-annually, or quarterly.

Given these two different decision processes, it is essential that *both processes be functioning well*,

and most important, that they be *integrated and harmonized*. We saw many instances where only one process was working: For example, no kill decisions were ever made at the gates, so the company placed an over-reliance on portfolio review meetings to weed out poor projects. In other firms, the gates were effective, but rarely was the entire list of projects reviewed to prioritize projects against each other, check for balance, and check for strategic alignment. Neither situation was desirable.

3. Imaginary precision

A universal weakness was that virtually every portfolio model we studied *implied a degree of precision far beyond people's ability to provide reliable data*. That is, the models' sophistication far exceeded the quality of the input data. Ironically, some managements confessed to being mesmerized by their models into believing that the data was quite accurate: the various financial models, rank ordered lists or bubble diagrams appear so elegant that one sometimes forgets how imprecise the data is upon which these diagrams or charts are constructed. Clearly, before one proceeds to develop even more sophisticated portfolio approaches, there is a great need to bring the quality of the data up to the levels needed in the current models.

4. Shifting resource commitments

Should viable and active projects be killed or de-prioritized, just because a better one comes along? We encountered two very different philosophies here:

- ▶ *View # 1:* Resource commitments to projects *are not firm*. Rather, they are infinitely flexible: resources should be moved at will from one active project to another project. For example, even though one project has been given a Go, and resources have been committed, and even if it remains a positive one, when a better project comes along, then resources can be stripped from the first project to feed the second. The argument here is that management must have the flexibility to optimally allocate resources, regardless of commitments previously made to project teams: survival of the fittest!.
- ▶ *View # 2:* Resource commitments *are quite firm*. That is, resource commitments made to project teams must be kept - for the sake of continuity and morale - even though a more attractive project comes along. The notion here is that while it may be desirable to have resource flexibility in order to allocate resources optimally, the human side - team morale, commitments, and not "jerkling around" project teams and leaders - is more important. Further, if projects are "on again, off again", there is a great waste of resources and time: shifting resources from one project to the next is not seamless: there are start-up and shut-down costs and times. Finally, newer projects always look better than ones that are partway through development (warts always seem to appear as time passes!), so that the inevitable outcome is that resources are stripped from projects in their later phases to support new ones: taken to an extreme, no project ever is completed!

Generally companies with a longer term perspective, and with considerable experience in major new product projects embraced the more stable view, # 2 - that resources committed are firm, while firms in shorter term projects and in very dynamic markets leaned more to the flexible resource model.

5. Too many projects “on hold”

More projects pass the gate criteria than there are resources to fund them. This places even greater pressure on the prioritization process. In some firms interviewed, the list of projects “on hold” was far longer than the list of active projects!

The problem here is that no one - especially some senior managements - wants to kill potentially good projects, even when it is recognized that:

- there are likely a number of other projects better than this one; and
- prioritization decision are essential to achieving focus - this means killing projects.

So it becomes much more convenient to start a Hold Tank, and dump good projects into this tank. The implicit argument is this: A kill decision is averted - *no one's feelings are hurt*; and besides, someday there may even be resources available to do some of the projects in the Hold Tank (often wishful thinking on the part of the senior gatekeepers).

When it first implemented its stage-gate™ new product process, ECC encountered this “on hold” problem, and a log-jam of projects awaiting entry to Development occurred. When the “hold list” exceeded the active project list, management knew they were in difficulty. A new decision rule was instituted: a project can remain on hold for no longer than three months. After that, it’s “up or out” - either it becomes an active and resourced project, or it’s killed. Brutal perhaps, but at least the rule forces the gate decision-makers (gatekeepers) to be more discriminating and make tough decisions. Further, it has made gatekeepers search for additional resources for meritorious projects that are in danger of being killed.

6. Why have a prioritized or rank-ordered list at all?

According to management in one leading firm, there are only three classes of projects:

- ▶ funded and active projects - with people assigned;
- ▶ good projects, but with no one working on them (currently unfunded) - these are the on hold projects; and
- ▶ dead projects.

If there are only three types, why the need for rank-ordered lists? In short, management here believed there was no great need for a prioritization or scoring scheme, or any other model which led to a rank ordered list. All that was needed was a *triage scheme*: active; hold; or dead!

A contrary opinion expressed at many other firms is that a rank ordered list is not only important, it is necessary. For example, even though a project is Go, there are *varying degrees of Go*, depending on the project’s importance, pay-offs, and priority. As an illustration, management at Hoechst regularly selects a sub-set of active projects, and performs a *full court press* on these: that is, they resource these chosen projects to the maximum, ensuring that they are done as quickly as possible. Given that different levels of resource commitments can be made to any project, logic dictates that not only must projects be separated into Go and Hold categories, but that Go projects themselves must be prioritized. Those top priority projects receive maximum resources for a timely completion.

7. Must consider all projects

All projects which compete for the same resources ought to be considered in the portfolio approach. This includes new product projects as well as process improvements, cost reductions, fundamental research, and so on. Conceptually, this is quite correct, but it does increase the magnitude of the portfolio problem: rather than simply comparing one new product project versus another, now management must deal with a myriad of different types of projects a much more complex decision situation.

This issue of whether or not all projects should be compared against each other yields proponents on both sides of the argument. Some firms studied simply set aside envelopes of money for different types of projects; and within each envelope, projects are then rated and ranked against each other. The Strategic Buckets Model outlined above is an example of this, which solves two thorny problems:

- ▶ First, the Strategic Buckets Model obviates the task of comparing and ranking unlike projects against each other - projects which may have a different nature and quality of information (for example, a process improvement project is likely to have fairly predicible cost and benefit estimates, while a new product project does not, especially early in the project)
- ▶ Second, by setting aside buckets of money or resources, one is assured that spending and resource allocation mirrors the business's strategy. Recall that this is the major strength of the Strategic Buckets Model: it forces resources to be allocated into buckets *a priori*.

The opposing viewpoint is that *all projects should compete against each other*; and that there should be no pool of money or resources set aside for any particular type of projects. For example, if all the cost reduction projects are superior to all the new product projects, then all the resources *ought to go to* the process improvement projects! In short, the merits of each project should decide the total split of resources, rather than having some artificial and *a priori* split in resources.

8. Information display versus a decision scheme

Should the portfolio model merely *display information to managers* in a useful way (as bubble diagrams do); or should it produce a *prioritized list of projects* (as a scoring model does)? The *display approach* means that management must review the various maps and charts, integrate the information, and then arrive at a prioritized list themselves. By contrast, the *prioritized list* approach provides management with a "first cut" list of projects, prioritized according to certain criteria; management then reviews and adjusts the list as needed.

9. Information overload

One deficiency with certain mapping approaches is the large number of maps which are possible. Admittedly, portfolio selection is a complex problem, and hence one is tempted to *plot everything versus everything*. As noted above, there are many possible parameters to consider: indeed the permutations of X-Y plots, histograms and pie charts is almost endless.

Are managers overwhelmed with all the information and plots? Experience in some firms suggests

yes: for example, when first conceived, Reckitt & Colman's portfolio method contained far more maps and charts than the final version now in use. What managers quickly realize is that they must simplify the problem, and boil the decision down to a few key parameters and hence a few important charts. Some of the more useful maps and charts from among the many we saw in companies:

- ▶ the Reward versus Risk bubble diagram or map (NPV versus Probability of Success).
- ▶ a non-financial version of the Risk/Reward bubble diagram (where the two axes are scored indices, derived from the gate scoring model).
- ▶ the Concept Attractiveness versus Ease-of-Implementation bubble diagram.
- ▶ the timing histogram (where resources are being spent - projects by year-of-launch).
- ▶ various pie chart breakdowns: project types; and across markets, technologies and product lines.

10. Financial analysis methods pose problems

For most firms, strict reliance on financial methods and criteria in order to prioritize projects was considered inappropriate: financial data are simply too unreliable during the course of a project, especially in the earlier phases when prioritization decisions are most needed. Post project reviews suggested that estimates made on key variables, such as expected revenues and profits at the Go-to-Development decision point, were highly inaccurate. Yet this is the point where serious resource commitments are made and the project must be in the portfolio model.

A second problem was that sophisticated financial models and spreadsheets often implied a level of reliability beyond the facts the data were based on: computer based spreadsheets in some firms had become quite complex, and produced best case and worst case scenarios, sensitivity analysis, and so on. So impressive were these financial models that managers began to believe the financial projections!

Even when valid financial data were available and reasonably reliable, there were still problems. Here are some of the ones we heard:

- ▶ How does one deal with the possible *cannibalization of other products* already in the product line? Often negative interrelationships among products - especially between new and existing products - are complex; hence quantitative estimates are difficult to arrive at. For example, a new product might be expected to cannibalize the sales of an old product in the company's line-up. But at how fast a rate? Reliable estimates are very difficult to make. And the argument that "if we don't cannibalize our own products, a competitor surely will - thus no cannibalization costs effects should be borne by the new product" was often heard. The issue is difficult to resolve.
- ▶ How does one treat *capital cost requirements* in the case of *shared or idle facilities*? For example, one capital intensive product developer always faced the problem of determining the cost of spare production capacity on capital equipment - how much cost should the new product project bear? Some pundits in the company argued "none": after all the equipment is idle, so there is no opportunity or incremental capital cost here. Others in that company made a case that the new product should bear a "fair share" of the equipment capital costs, even when equipment was otherwise idle. Finally, the argument often was that the equipment may be idle this year, but may not be next year, so there really is an opportunity cost.
- ▶ How does one treat *terminal values* of projects? That is, what is the project "worth" at the end of the five or ten year projection considered in the cash flow analysis. Assuming that the project is

worth nothing after, say, ten years, could penalize a project severely, especially in the case of projects where the internal rate of return (ROI or IRR) is low and close to the hurdle rate⁹.

Our Recommended Portfolio Management Process

Which portfolio management process is right for you? This is not an easy question, as there is no single right answer here. But here are some recommendations based on our study of these firms, what appeared to work, and managers' comments about the various methods:

There are four decision processes at play in deciding the business's portfolio:

1. *Corporate Planning*: this is the well-known process whereby a company's resources are allocated among business units (BUs), each with its own mission and strategy. Here, for example, the BU's total R&D, Marketing and capital budgets may be decided.

Comment: Corporate Planning and resources allocation across business units is a well documented process, has had many models proposed over the years (for example, the BCG 4-quadrant model or the GE/McKinsey nine-cell model [4,5]), and is beyond the scope of this article.

2. *Strategy development at the business unit (BU) level (see top, Exhibit 9)*: Ideally the BU's business strategy also includes a new product strategy, which specifies new products goals (e.g., percentage of sales to be derived from new products), arenas of focus (e.g., those markets, technologies and product areas where new products will be developed), and even attack plans and relative priorities (e.g., the desired breakdown of spending across markets, technologies, product categories and project types¹⁰).

Suggestion: If your business unit lacks such a business and new product strategy, consider developing one. This is the domain of the leadership team of the BU. Without such a business and new product strategy in place, portfolio management becomes next to impossible.

3. *The BU's New Product Process (right side, Exhibit 9)*: this is the formal process or road map which drives new product projects from idea to new product launch (e.g., a stage-gatetm process). This process typically has multiple stages, steps or phases, and most important, gates or decision points: the gates are where Go/Kill decisions are made on individual projects, and hence where resources are allocated.

⁹ Note that when the IRR (or discount rate) is quite high in a 10-year cash flow analysis, the value of income earned in year 11 is almost negligible; but when the IRR is low, the value or income from the project in year 11, when discounted to today, can be significant.

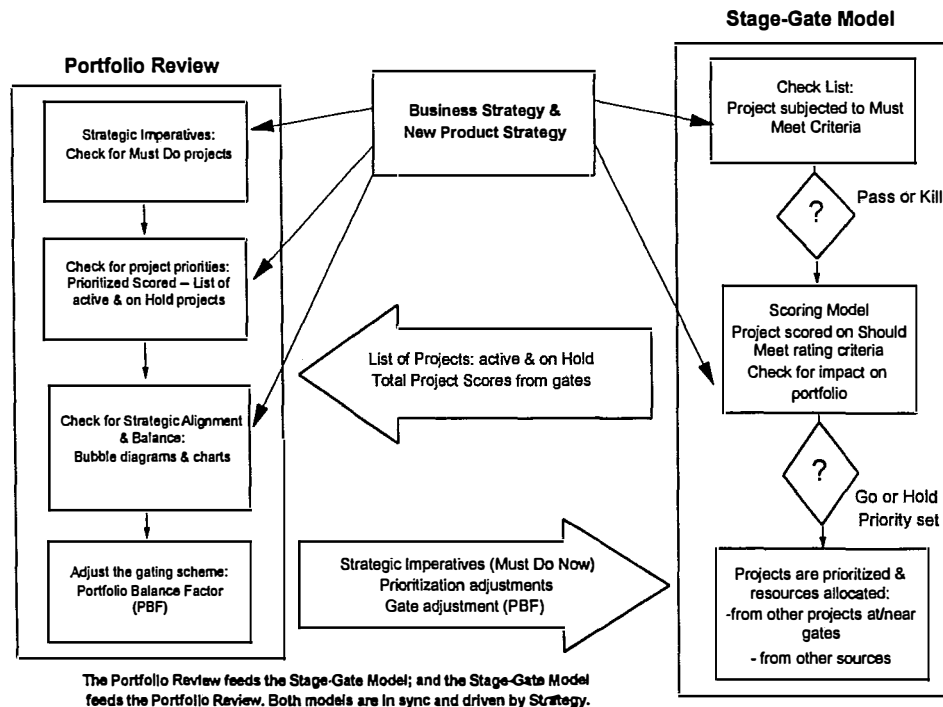
¹⁰ Project types: for example, genuine new products; product improvements, enhancements and extensions; new applications and market developments; customer support projects; cost reductions and process developments; fundamental research; and trouble-shooting or plant support.

Exhibit 8: Projects Prioritized Within Strategic Buckets

New Products: Product Line A Target Spend: \$8.7M	New Products: Product Line B Target Spend: \$18.5M	Maintenance of Business: Product Lines A & B Target Spend: \$10.8M	Cost Reductions: All Products Target Spend: \$7.8M
Project A 4.1	Project B 2.2	Project E 1.2	Project I 1.9
Project C 2.1	Project D 4.5	Project G 0.8	Project M 2.4
Project F 1.7	Project K 2.3	Project H 0.7	Project N 0.7
Project L 0.5	Project T 3.7	Project J 1.5	Project P 1.4
Project X 1.7	Gap = 5.8	Project Q 4.8	Project S 1.6
Project Y 2.9		Project R 1.5	Project U 1.0
Project Z 4.5		Project V 2.5	Project AA 1.2
Project BB 2.6		Project W 2.1	

Projects rank ordered within columns according to a financial criterion: NPV * Probability of Success; or ECV; or a scoring model.

Exhibit 9: The Total Portfolio Management Process (PMP) Linking Strategy, the Portfolio Review, and the NP Process or Stage-Gate Model



Suggestion: The New Product Process must have tough gates, complete with rigorous criteria, where mediocre projects are weeded out. Given that multiple criteria are often required to select projects, we recommend the use of a *scoring model*, much like Hoechst's model described in Part I. Moreover many managements are reluctant to place too much emphasis on a singularly financial method to rate projects, given the inaccuracy of such data, specially pre-Development.

Prioritization should also take place at gates, as resources must be allocated (one can no longer wait for semi-annual reviews to make these resource allocation decisions, given the desire for cycle time reduction!). Resource allocation is made by comparing the project score of the proposed project to the active projects already in the pipeline, as well as to those "on hold" awaiting resources.

4. *The Portfolio Review (left side, Exhibit 9):* this is the periodic review of the portfolio of *all projects*. It is here where all projects - active projects and even those on hold - are reviewed and compared against each other. The vital question here is: Do we have the right set of active projects here? Is this really where we want to spend our money?

Suggestion: The Portfolio Review should be a periodic check on the decisions made via the gating process, and held semi-annually or quarterly. If the gates are working well, the Portfolio Review should be merely a course correction; if too many Go and Kill decisions are made at this Portfolio Review, then look hard at your gating process something is wrong here!

The Portfolio Review must consider all projects together: it is holistic. Think of the gate decisions, which deal with individual projects, as the fingers; and the Portfolio Review as the fist. Here, be sure to check that the projects in the portfolio meet the three goals of portfolio management: maximum value to the business; balance; and strategic link. We recommend the following portfolio models for use at the Portfolio Review:

- ▶ *Maximum Value:* The gate scoring model, suggested above, can also be used to rate and rank projects at the Portfolio Review, yielding a prioritized list of the best projects, much like Hoechst does.
- ▶ *Balance:* This is best portrayed by the various visual charts:
 - If your business is very financially driven, and if financial projections for new products are quite predicable, then we suggest the standard NPV versus Probability of Technical Success bubble diagram (as in Exhibit 3 in Part I). If there are goals in addition to financial ones, and if financial estimates are uncertain, place less reliance on these financial numbers, and utilize a bubble diagram whose axes are derived from the scoring model factors (as does Specialty Minerals, described in Part I).
 - Standard pie charts and histograms which capture split of spending across markets, product categoric, technologies, project types and launch timing.
- ▶ *Strategic Alignment:* Consider using the Strategic Buckets approach in order to pre-allocate funds to various buckets: for example, across project types or across markets, technologies or product lines. Alternately, use the strategic check approach to ensure that the spending breakdown at least mirrors strategic priorities. Additionally, be sure to build in strategic criteria - fit and importance - into your scoring model in order to drive on-strategy projects toward the top of the list.

Your company should have all four processes above in place, and they must work in order that an effective portfolio management takes place. Three of these take place within the business unit (shown in Exhibit 9). These we call the Portfolio Management Process: business unit strategy development, the New Product Process with its gates, and the Portfolio Review.

The three decision models ideally are integrated, in harmony and feed each other (refer to Exhibit 9). For example, the business's strategy (top) drives the gating method by providing key criteria for the scoring model; it also provides key criteria for the portfolio review, helps to establish the targets for various spending breakdown or buckets (for balance), and even identifies strategic imperatives ("must do now" projects). Similarly, and referring to Exhibit 9, the gating process (right) feeds the gate decisions and project scores to the Portfolio Review (horizontal arrow, heading left). Finally the Portfolio Review (left) feeds strategic project decisions (imperatives) and gate adjustments to the gating process (horizontal arrow, heading right in Exhibit 9). These gate adjustments simply adjust the gate criteria or scoring model to favor project types which are deemed "desirable but under-represented" in the portfolio, and moves the project portfolio towards the ideal balance.

If all three elements of the Portfolio Management Process are in place - the business's strategy, the New Product Process, and the Portfolio Review (with its various models and tools) - then a harmonized system should yield excellent portfolio choices: projects that deliver economic pay-offs to the business, which mirror the business's strategy and direction, and achieve the BU's goals for new products. But if any piece of the process in Exhibit 9 is not working - for example, if there is no clearly defined BU strategy, or if the new product process and gating process is broken - the results are less than satisfactory [5].

* * *

New products are the leading edge of your business strategy. The product choices you make today determine what your business's product offerings and market position will be in five years. Making the right choices today is paramount: Portfolio management and new product project selection is fundamental to business success. Make sure that you have the tools you need to make these right choices - an effective Portfolio Management Process¹¹ - in your business!

¹¹ For more information on our recommended portfolio management approach, see the new book by the authors: *Portfolio Management for New Products*, McMaster University, Hamilton, Ontario, Canada, 1997 [6].

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