



R&D investment execution

Improving efficiency
and effectiveness



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Overview

Research and development (R&D) investment is widely understood to be a critical lever that companies use to continuously improve their products, services and operations. Although typically concentrated in research and development of products, R&D investment actually encompasses a wide variety of spending categories, which contributes to challenges in effectively managing R&D investment.

This paper explores the environment associated with R&D investment management. It illustrates a number of key capabilities that improve R&D investment outcomes, identifies some key challenges that are typically faced by companies trying to improve their R&D investment results, and profiles a project where EY assisted one of our clients to transform its R&D investment capabilities.

R&D investments are critical, but outcomes are often unpredictable

In a global survey of 641 corporate executives, EY's *Business Pulse* report ranks innovation in products, services and operations as the top area of opportunity for their enterprises.¹ In the quest for innovation and competitive advantage, the primary enabler is R&D spending. Even the most efficient operations-oriented enterprises realize that cost reduction has its limits and must be balanced by the need for new products, services and innovative ways of working. Evidence suggests that the importance of R&D spending is continuing to grow even during difficult economic times. Since the financial crisis in 2008-09, the world's top 2,000 R&D investing companies have expanded their R&D investments approximately 6% annually, during a period of generally reduced net sales growth and squeezed margins.²

While there may be increased levels of R&D spending across businesses, those investments aren't always productive. In fact, a study involving over 10,000 analyses of R&D spending across the 1,000 largest R&D spenders found no statistical correlation between R&D spend and sales growth, gross profit growth, operating profit growth, operating margin, net profit growth, net margin, market cap growth or total shareholder return.³ The lack of direct relationships between levels of investment and performance results suggests that the selection and management of the specific projects in the R&D portfolio is critical.

Although effective project and portfolio management is critical to R&D investment results, it often is not performed well. Year after year, over a five-year period ending in 2016, an annual survey of project management practitioners and executives found that two-thirds of projects did not meet original goals/business intent, one-half were not completed within the original budget and one-half were not completed within the original schedule and 15% of projects were deemed to be a failure.⁴

In spite of the lack of correlation between, increased R&D spending and higher performance or productive outcomes, and the general lack of project and portfolio management effectiveness, one bright spot related to R&D spending is the significant value produced by R&D investments that are globally diversified. A recent innovation study found that companies who overweight their R&D spending outside their headquarters country significantly outperform their less-globalized competitors. Companies that deployed 60% or more of R&D spending abroad in 2015 earned a premium of 30% in operating margin and return on assets and 20% on growth in operating income over their domestically focused competitors.⁵

"R&D investment is an area where decisions significantly impact top- and bottom-line results. Despite the importance of R&D investment, the related policies, processes and systems are often not as robust or consistently followed as those within other areas of businesses"

– Mark Heidenreich
Advisory,
Performance Improvement
Ernst & Young LLP

1 EY, *Business Pulse: exploring dual perspectives on the top 10 risks and opportunities in 2013 and beyond*, 2013.

2 Arthur D. Little, "How to manage your return on investment in innovation," January 2014.

3 Strategy & 2015 Global Innovation 1000 analysis, Bloomberg data, Capital IQ data.

4 Project Management Institute, "Pulse of the Profession, 8th Global Project Management Survey," 2016.

5 Strategy & Business, "The Global Innovation 1000 Innovation's New World Order," Winter 2015.

Challenges in defining, developing and valuing R&D investment projects

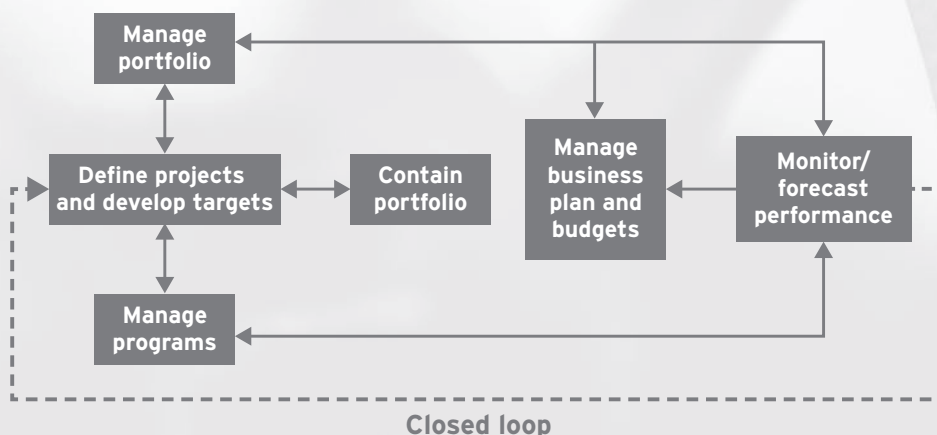
There is a great deal of variability in what constitutes R&D spending. Per *Bloomberg View*, "As the Financial Accounting Standards Board concluded many years ago: Differences among enterprises and among industries are so great that a detailed prescription of the activities and related costs includable in research and development, either for all companies or in an industry by industry basis, is not a realistic undertaking for the FASB."⁶ Consequently, the projects that make up the R&D spending portfolio can include pure research, development of new products, depreciation, new buildings, new computer systems and a wide variety of other investments.

The variability of R&D investment categories significantly increases the policy and process challenges associated with defining and estimating the variety of project investments that comprise the portfolio. The part of the organization defining projects that are core to the business typically has a great deal of policy and process discipline with regard to how they are constructed, approved and managed. Conversely, the often significant percentage of investment that is composed of projects that are non-core and widely variable is not subjected to the same level of definition, review, approval and management discipline. Examples of non-core R&D activities might be research into new technologies, development of functions or capabilities to support multiple product programs, or work at the "fuzzy front end" of the product development process that takes place before a product development program is formally sanctioned.

Successful management of R&D spending for core and non-core investment is dependent upon a robust set of processes that are coordinated, integrated and measured. This type of framework improves day-to-day management of the R&D investment portfolio while additionally establishing an ability to continuously improve the efficiency and effectiveness of these efforts.

Following is a sample of key challenges often faced when defining and developing R&D investment projects.

R&D investment process



"Active participation is required from all relevant stakeholders to increase the potential from the investments being made. Integration and coordination of the processes and information throughout the full investment life cycle leads to better investment decisions and management."

– Bart Huthwaite
Advisory,
Performance Improvement
Ernst & Young LLP

⁶ *Bloomberg View*, "The Big Spenders on R&D," April 2016.

Challenges

Physicals-based estimating and target setting

Insight

Estimating and target setting for major capital projects is often highly variable from project to project. Some projects are estimated top down, some are bottom up, and others are some combination of both. Often the actual timing of expenditures is misaligned with the estimates or the total cost magnitude is significantly off or both. Companies that are able to drive an increasing percentage of bottom-up or physicals-based estimates are typically able to better forecast spending and ultimately fund more projects.

Questions

- ▶ Is project estimate accuracy regularly measured?
- ▶ How accurate are project estimates?

Investment valuation management

Insight

Realistically determining the cost of an R&D investment is critically important; however, it must be balanced with a similar level of emphasis on the associated valuation of the related benefits. Realistic costs and benefits form the foundation of go/no-go decisions for projects. Establishing and enforcing standard benefit valuation processes, models and methods is crucial, but so is the determination of the input assumptions. Even organizations that have robust investment valuation practices often sometimes make decisions based upon executive intuition or gut feel. In addition to supporting the initial investment decision, the valuation process for certain investments should be re-examined while the project is in flight to reflect changes in investment costs and/or major assumptions underpinning the benefits.

Questions

- ▶ How thoroughly and consistently are both the costs and the benefits associated with investment projects determined?
- ▶ Are costs and benefits regularly revisited on major in-flight projects?
- ▶ Are in-flight projects ever canceled when changes in costs or benefits deviate significantly from the original decision criteria?

Change management

Insight

Changes during the capital allocation management process are inevitable. Examples might include new scope that is added to an in-flight program, addition of a new program to the portfolio, shifting of timing for a program in the portfolio, or reduction in spending that needs to be distributed across a number of programs in the portfolio. Changes supporting establishment of new portfolio items or changes to an existing portfolio must follow a workflow with predetermined reviews and approvals in order for a capital allocation process to be adequately controlled. Additionally, whether the change affects planning of new programs or causes revisions to existing ones, having an adequate audit trail is critical for accurately responding to the inevitable question, "What changed?"

Questions

- ▶ How difficult is it to compile a recap of the changes from period to period?
- ▶ How difficult is it to understand and explain the changes from period to period?

Continuously improving estimating and program execution

Insight

The capital investment portfolio is typically composed of a series of capital projects whose cost estimates or targets have been determined through some methodology. The portfolio often consists of complex, one-of-a-kind projects on one end of the spectrum and repeatable line extension or minor product modifications on the other end. Continuously improving the ability to develop estimates and set targets across the full spectrum of investment project types is critical to effectively managing capital programs and is challenging to perform consistently well. Establishing a process that examines, analyzes and corrects for the variations between estimated and actual results is key to improving R&D execution and ultimately the allocation of future investments.

Questions

- ▶ Do you regularly perform a process to close the loop and continuously examine, analyze and modify the estimating models used for estimating R&D projects?

Challenges in managing the R&D investment portfolio

The previously discussed benefits require an ability to make R&D investments on a globally diversified basis, which adds an enormous amount of executional complexity. Differences in policy, process, currency, language, information systems, time zones and organizational structure are but a sample of the variables that must be considered when managing a global R&D investment portfolio.

Integrating the management of the individual projects with management of the overall portfolio is a key foundational capability required for successful R&D investment execution. Policies, processes, systems and an organization that perform strategic planning, finance management, resource management, and business intelligence and analytics round out the capabilities required for successful R&D investment management.

Following is a sample of key challenges typically faced when managing the R&D investment portfolio.

Capabilities critical to successful R&D investment



“A key question at many companies is, ‘How can we better leverage our resources around the globe to maximize efficiency and deliver improved R&D outcomes?’ This question can’t be answered without a unified way of tracking employees’ skill sets and project staffing.”

– Rose Martin
Advisory, Performance Improvement
Ernst & Young LLP

Challenges

Inconsistent development and understanding of investment information

Insight

Whether setting up a new information systems capability or transforming an existing one, an often communicated operating principle is the need for the solution to generate information and insights consistently and accurately, often described as operating with a single source of truth. Many organizations continue to struggle with R&D investment environments that are managed largely via spreadsheets, email and a variety of inconsistent policies and processes that are used to support R&D investment management. Companies that have successfully addressed this have reduced manual data entry, reduced processing cycle times, increased information accuracy and ultimately improved capital allocation management decision-making.

Questions

- ▶ Has your organization experienced instances in which the lack of consistency and accuracy led to a suboptimal capital allocation decision?
- ▶ What changes would need to be made to processes and systems to eliminate the major information accuracy error states?

Global consistency and standardization

Insight

Capital project planning, estimating and execution for large organizations are often globally dispersed. With this geographic distribution typically comes significant variation in policies, processes, tools and methods that add complexity and error when trying to consolidate data to obtain a comprehensive and accurate view of capital allocation plans and make comparisons to actual spending results. Exchange rate management is one example of a requirement that often adds a significant challenge to effective global capital allocation, especially in environments managed largely via spreadsheets and email.

Questions

- ▶ How geographically distributed is capital allocation management in your organization?
- ▶ Do you frequently encounter difficulties understanding and reconciling changes to the consolidated capital plan?

Concurrent planning and execution

Insight

Effective R&D investment management should include an ability to support long-range planning while simultaneously incorporating the forecasts and actuals from ongoing programs. Leading organizations are able to regularly capture updated spending forecasts and actual spending as they are developed or reported through the course of regular reviews or completion of program milestones. These updates are then able to feed both regular program and portfolio status reports while also informing the long-range planning that is updated semiannually or even quarterly.

Questions

- ▶ How often are long-range plans updated?
- ▶ Do long-range plans systematically incorporate actual and forecast updates from ongoing programs?

Resource management

Insight

Non-contract resources and some specialized retainer-type contract resources are essentially a fixed cost regardless of how they are deployed. The inability to obtain project approvals, delays in project approvals or inaccurate forecasting of resource demands are examples of situations that contribute to reduced productive or chargeable resource utilization. Accelerating program approval process cycle times, improving estimating and target-setting accuracy, and improving forecasting accuracy all contribute to higher resource utilization and ultimately reduce labor cost. Another common major challenge is inconsistency and inaccuracy of actual time reporting. This results in an inability to understand where resources are deployed and what they are really doing. Not having a robust resource management/deployment process also leads to delays in staffing and lower utilization. Although the most common resource management emphasis is for human capital, many of the same challenges are often experienced in the management of specialized machinery or facilities resources.

Questions

- ▶ Is chargeable or productive resource utilization regularly measured?
- ▶ What is the overall chargeable or productive resource utilization, and how has it been trending?

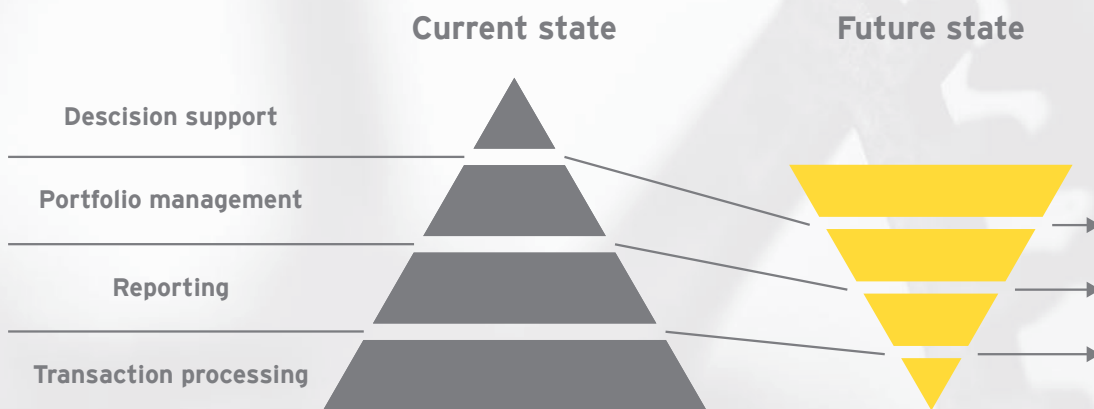
Challenges in forecasting, reporting, analyzing and making decisions

One of the common complaints expressed by organizations is the inability to compare plan vs. forecast vs. actual in a timely manner. Often times, project estimating, project management, financial forecasting and actuals reporting are all performed in separate solutions. These are delivered through a myriad of spreadsheets and point solutions that provide responses to management information requests, capital planning process documentation, regular operating reports, board of directors meeting material, International Financial Reporting Standards (IFRS) financial reporting and a variety of other requests for information.

The level of effort required to accurately provide this information and respond to these requests results in longer cycle times and an inability to produce the information as frequently as management would like. This leads to lengthy periods between project and portfolio reviews. As a result, R&D investment planning is conducted annually, when semi-annually or quarterly would enable more frequent plan adjustments and improve the organization's ability to produce the information and insights necessary to magnify R&D investment management.

Following is a sample of key challenges typically faced when providing R&D investment forecasts, reporting and analysis.

Reducing effort and increasing value through automation and analytics



"Financials are merely outcomes, not explanations. The stronger the connection to operations, the more effectively organizations are able to leverage key business drivers to improve planning, forecasting and decision-making."

– Rose Martin
Advisory, Performance Improvement
Ernst & Young LLP

Challenges

Spending forecast accuracy

Insight

The lack of accuracy associated with capital spending results in missed opportunities due to inefficient capital allocation. Many enterprises often significantly miss the timing or overall magnitude of their planned spending levels for major capital projects. This variation from planned spending results in projects that are not funded, projects that are canceled, resources that are suboptimally deployed and other capital allocation inefficiencies.

Questions

- ▶ What process and information management changes would be needed to drive this improvement?

Accurate and timely analytical insights

Insight

The holy grail of capital investment management is an ability to consistently and efficiently convert data into information, actionable insights and decisions. Establishing an environment that consistently provides accurate spending data, forecasts, plans, budgets, etc. is a critical first step toward accomplishing this objective. In addition to providing a comprehensive inventory of project-specific information, the environment should also incorporate data that has been provided by the sources of record for labor actuals, forecasted product sales volumes, currency exchange rates, general ledger updates, capital spending actuals, etc. The other key element of the solution is a business intelligence capability that provides dashboard, reporting, query and analytics functionality so that the user community is able to efficiently and effectively generate the desired insights.

Questions

- ▶ What types of business drivers or insights are we currently unable or challenged to produce with our current process, tools and organizational structure?
- ▶ What types of business benefits could be derived from improvements in our business insights?

Decision support vs. transaction management

Insight

Large, complex organizations have correspondingly large and complex portfolios of capital projects. This requires substantial effort to track and forecast spending. As the size of the portfolio increases, typically the level of effort required to monitor and forecast spending also increases. Process or technology limitations may limit the ability to provide capital execution decision support.

Questions

- ▶ What capability and capacity exist to provide decision support so that the effectiveness of the capital investment portfolio is thoroughly evaluated on a regular basis?
- ▶ What are the barriers preventing an increased focus on improving capital allocation decisions?

R&D investment execution improvement in action

Situation

A global automotive manufacturer had a legacy global capital planning and forecasting environment that was extremely manual, labor-intensive and inefficient, which resulted in challenges in making proactive timely decisions. The processes, systems and tools were not integrated, making it difficult to maintain alignment between physical quantities and their associated costs. This also produced inconsistent estimates for new product development capital investment programs. The lack of integrated systems also contributed to inefficient processes supporting business planning, board of directors meeting preparation and IFRS-compliant financial reporting.

Approach and EY role

The project consisted of designing, developing and deploying a new integrated solution to increase the efficiency and effectiveness of product development resource planning and allocation, including human resources, engineering development and testing, prototype materials, tooling, facilities and purchased services. The global solution supports program target setting, project portfolio development and management, portfolio and program management, forecasting and budgeting, and human resource management. EY led the overall integration, data enablement, program management, organization change management and the deployment of a solution that integrated enterprise performance management, project and portfolio management, and a number of the client's legacy information system applications.

Value delivered

The project provided an integrated solution that supports capital planning and forecasting business processes used to manage thousands of engineering resources and billions of dollars in annual capital investment. The solution improved resource allocation and decreased the time required to deploy budget, thereby enabling increased productivity and improving investment efficiency. It additionally resulted in the integrated planning of headcount, prototype material/tooling, purchased services, and engineering design and testing in a way that will lead to improved investment estimating and target setting on new programs, resulting in a more efficient and effective use of capital.

“The integrated business planning solution we developed allowed the Product Development and Finance teams to leverage a consistent data set to make better capital planning, forecasting, and staffing decisions in a more collaborative and efficient manner.”

– John Carter
Advisory, Performance Improvement
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EYG no. 02404-164Gbl
1606-1960025
ED None

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