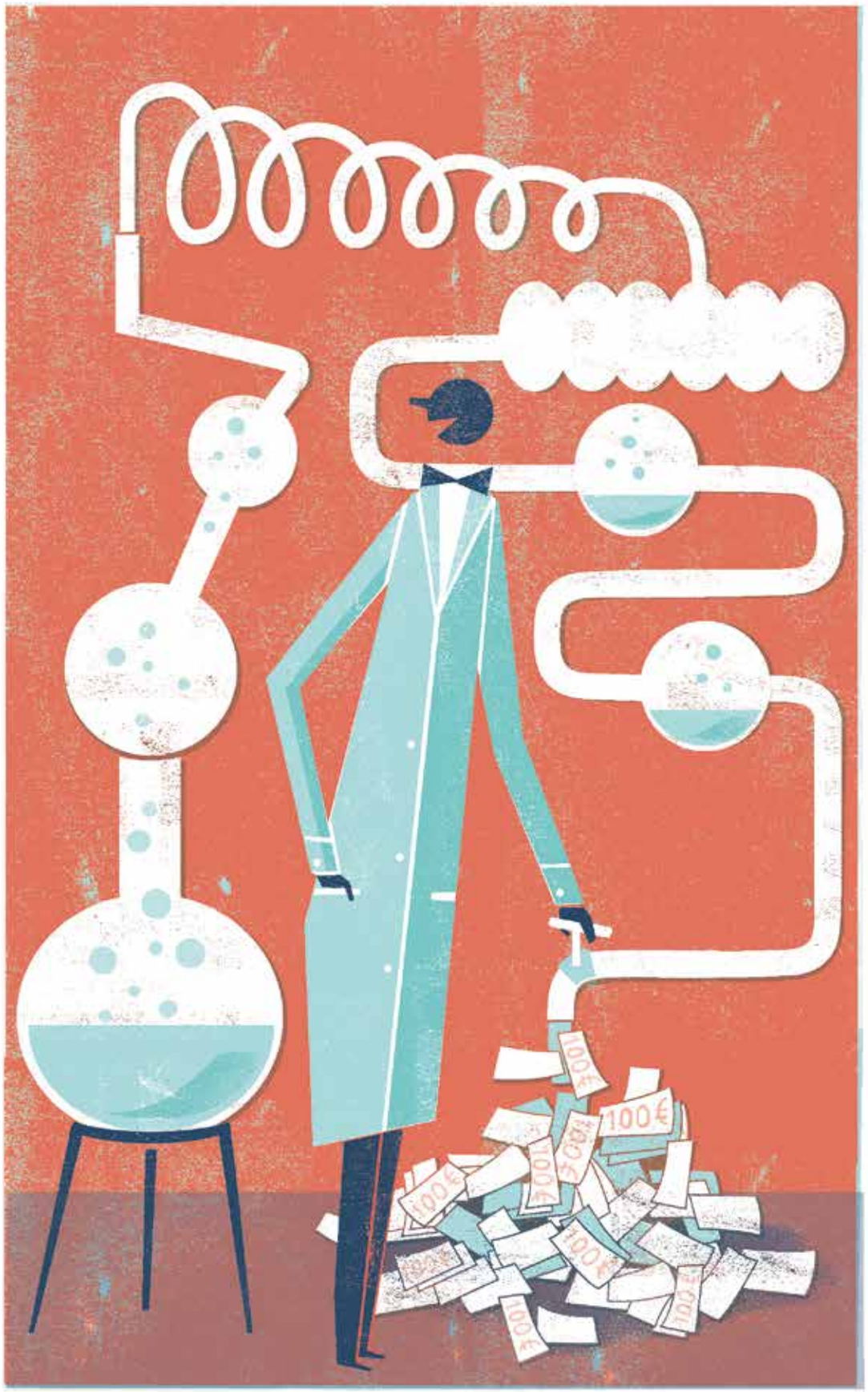


Illustration by Sylvia Neuner

How to manage your return on investment in innovation

Reaping the most from innovation investments

Michaël Kolk, Rick Eagar

Any CTO or Innovation Leader will be very familiar with the following question from the CEO. It goes something like "You know I'm fully committed to innovation… but is all of our investment really necessary? Our competitors seem to be growing as fast as us, yet they spend less of their revenue on R&D than we do. Can you assure me that we're really getting the best return on our innovation spend?"

What might seem at first sight to be a straightforward question can be quite difficult to answer. There are numerous complications around what we really mean by 'Innovation', 'Investment' and 'Return', and indeed what effective management means in this context, such as:

- What should we include and exclude in 'innovation investment?'
- What types of value do we care about?
- Which methods should we use to assess value?
- What's the best way to communicate the results?

In this article we explore the challenges of managing the Return On Investment (ROI) of innovation, and provide some examples of good practice and key factors for success.

In any company around the globe investment in innovation and R&D is under critical scrutiny. Is it going to the right places and is the amount spent exactly appropiate? Is the company getting the best return on its innovation spend? These are questions that any CTO today must be able to answer. In this article the authors explore the challenges of managing the Return On Investment (ROI) of innovation, and provide some examples of good practices and key factors for success.

The importance of managing the ROI of Innovation

Managing spend on R&D has always been an important priority for business, and this trend is increasing. For example, since the financial crisis in 2008/9, the world's top 2000 R&D investing companies have been growing their R&D investments by around 6% annually, during a period of generally reduced net sales growth and squeezed margins. Not only is spend on R&D increasing, but the type of R&D being carried out is also changing. In our previous article on the "The Creativity Era – A new paradigm for business", we made the case that in the face of drivers such as hyper-competition, technology disruption and new customer power, companies are increasingly looking to achieve growth from new non-core areas, requiring more focus on innovation – especially breakthrough innovation – in order to survive and prosper. Even in "traditional" sectors with longer product development cycles, companies are now taking on riskier, more long-term and/or more breakthrough non-core innovation projects as part of their portfolios. For example, the proportion of innovation spending on breakthrough innovation across companies has been shown to have increased by around 50% from 2007 to 2012[1]. Arthur D. Little's own 2011 survey of Chief Technology Officers revealed that the proportion of revenues from non-core business was expected to double in the decade after 2010[2].

At the same time, trading conditions in many economies remain challenging, and the pressure to justify and optimize investment and discretionary costs remains intense. Consequently, companies are looking to find more meaningful and robust ways to manage the value of their innovation portfolios to better meet the various needs of their stakeholders, be they the top team, shareholders, or potential partners.

[1] APQC, 2012
[2] The Future of Innovation Management, Arthur D. Little 2011

Some typical challenges

In principle, managing the ROI of innovation is simple: work out how much you spend on innovation and where you spend it, compare this with the added-value that each part of the portfolio delivers to the business, and take appropriate management actions to improve performance.

However, in practice, many companies struggle for a variety of reasons which are mainly concerned with the lack of a clear, shared view about what 'managing the ROI of innovation' really means:

- **What does "Innovation Investment" mean?** A key early challenge is to define clearly what is included in "Innovation Investment". Spend on R&D is clearly a significant part of this, but in many companies R&D spend also includes activities such as technical support, troubleshooting, product reformulations and quality testing. These activities do add value, but more in terms of risk mitigation, improved assurance and loss avoidance than in terms of growth. Should they be part of the "ROI of Innovation" equation?

An even bigger problem is that innovation is much broader than just R&D. For example, in consumer goods companies, brand innovation is often more important than technical innovation in terms of its direct impact on growth and margins, and this investment is usually made through Marketing or Brand Development functions rather than R&D. Effective innovators invest in innovation across many functions, such as manufacturing, procurement, IT, HR and finance. In some companies this type of innovation might be called Operational Excellence or Continuous Improvement. Should this also be part of the ROI equation? If companies just stick to R&D spend only, then they are missing the full picture. For example, if the CEO is looking for a direct link between R&D spend and growth, then he or she is likely to be disappointed – many studies have shown that there is no clear correlation between R&D spend and revenue growth, as shown by the following study of a selection of leading global food and drink companies:

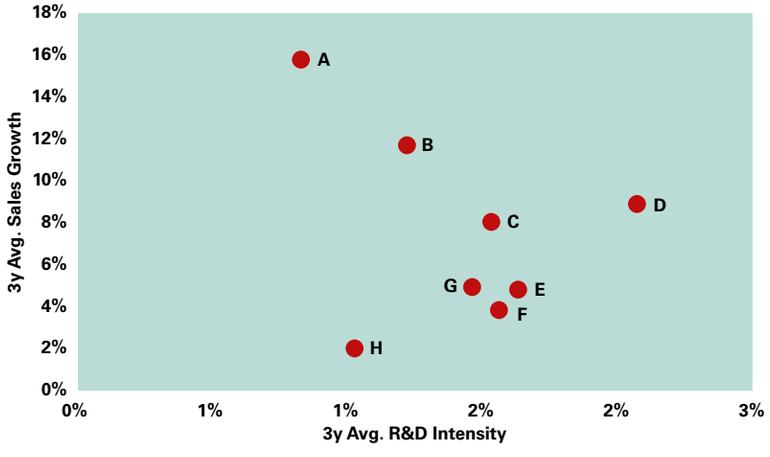


Table1
R&D intensity vs sales growth for global food & drink companies
Source: ADL analysis, Data from 2009 -2012. R&D Intensity means R&D annual cost as a proportion of annual sales

- **What does "Return" mean?** Estimating returns on innovation investment is often fraught with difficulty. The biggest challenge is that of dealing with risk and uncertainty, especially for investment in early-stage research, platform developments with multiple (perhaps as yet undefined) applications, and R&D which might be "enabling" – for example, R&D into methods and approaches which could be applied across different products, processes or services. Some R&D activities may yield hard-to-quantify benefits such as enhanced reputation or better environmental performance. The most commonly used valuation approach of Risk-adjusted Net Present Value, (i.e. standard economic analysis with adjustments to allow for uncertainties in future costs and revenues), starts to lose meaning in these situations, because it requires huge assumptions to be made on future revenue streams, based on little or no evidence. Sometimes it requires the use of theoretical algorithms that try to express things like reputation enhancement and customer satisfaction in monetary terms. Whilst these methods have their place, their validity is often open to question. A further pitfall in the estimation of returns is the assumption that "Do Nothing" means that revenues continue to flow as at present, whilst the reality may be that they will deteriorate if no changes are made.

- **What does "Manage" mean?** It may seem strange to suggest the term 'manage' is unclear, but actually there is often confusion between different management needs. For example, companies may need to manage the ROI of innovation in order to:
  - Make the business case for new investment in innovation.
  - Justify and communicate the current level of innovation spend to internal and external stakeholders.
  - Demonstrate company value to shareholders or to potential partners.
  - Optimize the value of the innovation project portfolio.
  - Inform technology and business strategy development.

  The management tools and approaches that you would use are not necessarily the same for all these differing needs, There are usually different stakeholders whose interests need to be considered, including the innovation management function itself, business leadership, potential partners and shareholders. This means that there are often challenges in establishing the right authorities and accountabilities to take management decisions on the innovation portfolio.

If these challenges are not properly addressed, there can be some undesirable consequences for the business, for example:

- Tendency to stifle long-term, higher risk/return, breakthrough innovation projects.
- Poorly optimized innovation project portfolio.
- Poor management decisions on key innovation investments.
- Imposed cuts on R&D and Innovation resources which could damage strategically important capabilities.

The net effect of these consequences can be very large indeed. We have worked for one packaging solutions company where the cumulative benefits of its R&D portfolio amounted to no less than 10 times what its historical performance would suggest, leading to a substantial but unnoticed shortfall in its innovation pipeline. On the other hand, we have witnessed how at a large and risk-averse chemicals conglomerate, people tended to discount R&D project

business cases to such an extent that only the most incremental innovations made it through all stage-gate reviews.

So how can these challenges be overcome? Based on our experience working with a wide range of companies we have identified four key factors for success.

Four key factors for success:

1 Articulate precisely your objectives in managing ROI and optimize their execution

First of all, it is important to be clear about why you are managing ROI and who the outputs are intended for. It is helpful to consider two "lenses" through which the innovation portfolio of activities can be viewed:

1. Realizing ambitions
2. Optimizing value, as shown below.

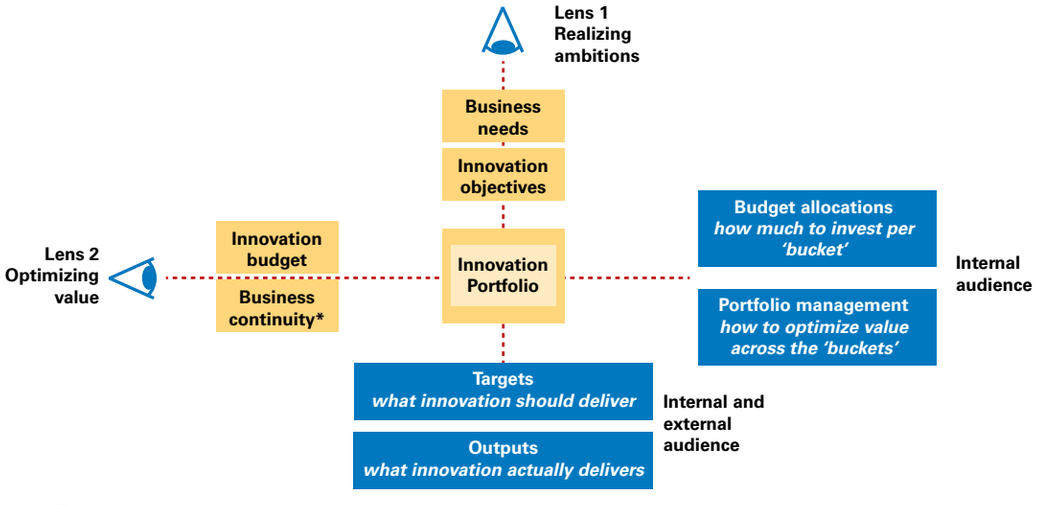
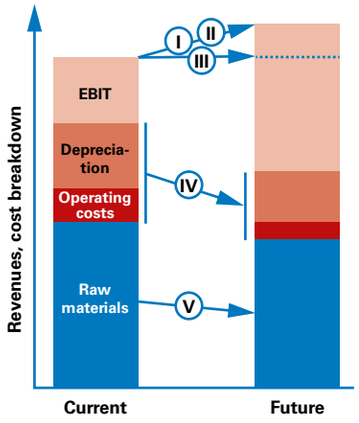


Table 2 **Two lenses to view the Innovation Portfolio** *Source: Arthur D. Little*

* Especially essential requirements such as quality, safety or asset continuity

An effective management approach for the ROI of innovation will balance both of these views:

Lens 1 Realizing ambitions:
Managing value in this dimension firstly requires clarity on the targets for what innovation should deliver. Good practice in this respect is to set some quantified delivery objectives. We typically recognize five types of innovation, and it is helpful to set targets for each type, as shown below:



Innovation type		Example approach
Product & service innovation	I Transform	• Grow new markets and new products/ processes/services
	II Enhance	• Grow in adjacent market areas (i.e. similar markets products/processes / services)
	III Defend	• Offer 'heart beat' of incremental product/process/service innovations
Process innovation	IV Increase asset / employee productivity	• Use technology to redesign supply chain concept • Realize process debottlenecking
	V Decrease raw material & energy intensity	• Reformulate ingredients • Change product/process /service composition

Table 3 **Setting targets and objectives for different types of innovation** *Source: Arthur D. Little*

Distinguishing between different innovation types is important because the nature of the value (returns) is different between Process and Product/Service innovation. By setting targets it is possible to link innovation investment in a direct way to the achievement of business goals, and clarify what is – and is not – included in the definition. For example, a global MedTech company we have worked for adopts this type of approach through its use of 'financial innovation roadmapping', in which roadmaps connect business strategy to innovation projects in a very direct way, as shown below:

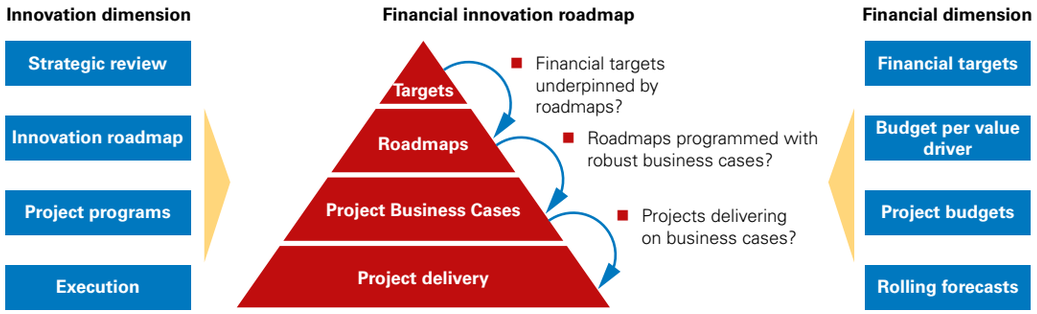


Table 4 **Financial innovation roadmapping**

Source: Arthur D. Little

Lens 2 Optimizing value:
Most companies we know have the bulk of their governance and processes in place to deal with Lens 2, which falls largely in the realm of normal R&D management. There are several very good text books on the subject of project portfolio management[3] and a wide variety of supporting tools can be bought from vendors, ranging from off-the-shelf modules linked to ERP systems to highly tailored automated innovation suites. As always in managing complex business issues, the difference between 'acceptable' and 'good' or even 'great' lies not so much in adopting certain processes or tools, but much more in letting these work for you rather than the other way round.

A first limitation that many companies seem to have accepted (but shouldn't) is that their portfolio management mechanism does not allow them to manage 'innovation', but looks exclusively at (incremental) product development, as was also pointed out in the previous paragraph. The second common shortcoming is that portfolio tools present management with lots of data that is related, but not quite relevant, whereas it should of course enable smart decision making by answering those questions that matter most to any given audience and meeting agenda. We have seen too many examples of companies where tools and processes have started to live lives of their own and where R&D managers and innovation boards have learned to 'go through the motions' while hardly ever getting to the most important or urgent questions at hand. The best portfolio management practices therefore are those that are designed to answer those questions at the right moment, using the right fact base to 'good enough' levels of detail and robustness:

[3] Arthur D. Little's book "Third Generation R&D Management" was a pioneering text on this subject

Key management questions	… and project parameters to optimize
Are we getting an optimal return on our project portfolio?	Rewards (e.g. EBIT or contribution margin) versus risk and investment
Are we working on the best projects?	Existing projects versus new project proposals (ideas)
Is our portfolio optimally balanced?	Investment versus time to market and "newness" of the product or technology
Are we utilizing all our material streams and assets?	Rewards (e.g. EBIT or contribution margin) versus material stream or asset
Should we accelerate certain projects?	Cost to deliver early versus additional rewards if launched earlier

Table 5
Commonly used R&D project portfolio analyses at leading companies
Source: Arthur D. Little

2 Clarify accountabilities and governance approach

Setting clear objectives and measuring performance against them is one thing, taking appropriate management action is another. The best companies in managing their ROI of innovation have in place clear and appropriate accountability for taking rapid decisions, based on the monitoring and feedback information they receive. Good practice in setting up a structure for accountability and governance includes the following:

- Create a cross-functional body with sufficient authority to take rapid decisions on resourcing, prioritization, and go/no go for projects in the innovation portfolio.

- Avoid separation between R&D/Technical and Marketing/Brand innovation project governance, since value is often created through integration and combination.

- Ensure that there are clear single-point responsibilities for implementation and maintenance of each of the chosen valuation processes, including data gathering, analysis and reporting.

- Formulate very clearly what responsibility and accountability means ("ownership of what?").

For example, a highly innovative chemical firm active in advanced materials has appointed a cross-functional team to create, update and manage a common innovation roadmap. This roadmap contains all major milestones to satisfy the unmet needs in priority market segments, and connects these milestones to (technical) performance features, R&D and technology requirements, and the competencies needed to fulfill these. Meeting the major milestones in the roadmap is now a common task for both Marketing and R&D, and matching KPIs are used in yearly performance appraisal.

Illustration by Sylvia Neuner

3 Take account of cannibalization and the "cost of doing nothing"

Developing a business case is like reading the altitude gauge in an airplane: cruising at 10,000ft above sea level offers little comfort when flying over a high mountain range. We have seen plenty of examples where forecasted sales of new products did not properly address the existing revenues these would be displacing ("cannibalization"). Or, conversely, business cases that conveniently assume existing products would continue to thrive into perpetuity at the same price levels and volumes, implying that there is no cost or penalty for doing no innovation at all.

Whilst it may be obvious that neither of such business cases is likely to be correct, in practice we see that these aspects are often overlooked. This may be acceptable if, for example, projects in a portfolio are very comparable in terms of market dynamics, but this is more the exception than the rule. Best practice in ROI valuation is for R&D, Marketing and other functions to work together to characterize and take account of:

1. Those sets of product-segment combinations in which current and future products compete for the share of wallet of similar customers.

2. Historical rates of margin erosion based on product life cycle analyses.

3. Likely product releases by competitors and of possibly disruptive technology developments.

4. Anticipated commoditization for existing and new product families. The higher the degree of commoditization, the larger the effect of cannibalization and the higher the likely cost of doing nothing.

Interestingly we observe that in many companies the Control/ Assurance function is stepping up to the plate to fulfill the roles of 'Legislator" (imposing requirements on how to develop business cases), 'Auditor' (poking holes in suspect proposals) and 'Arbitrator' (helping to resolve disputes). A benchmarking survey carried out in 2013 by Arthur D. Little on R&D support functions in technology-intensive industry sectors showed that most participants believed they would be increasing their spend on R&D-related Control in the coming years.

4 Use consistent logic and match valuation methodologies with levels of risk and uncertainty across the portfolio

One of the most important requirements for robust valuation of a portfolio is to use consistent logic throughout. In practice this often doesn't happen. There are five principles that can be applied to help:

- Single source of truth: Use commonly shared data for important and frequently used parameters, such as market growth rates.
- Transparency: Apply clear and consistent methods, assumptions, approximations and calculation models.
- Shared ownership: Ensure that all functions, such as R&D and Marketing, understand and support the approaches being used.
- Feedback & learning: Capture, track and feedback actual post-launch data to help improve prediction.
- Fit for purpose: Distinguish between data and methodology requirements for major versus minor investments.

Selection of the right valuation approaches for parts of the portfolio with different risk and reward profiles is one of the most important aspects of good practice. One helpful way to look at this is to consider the basic Growth Map for products/services versus markets, as shown in Box 1:

Box 1 - How to obtain a realistic valuation of your innovation portfolio

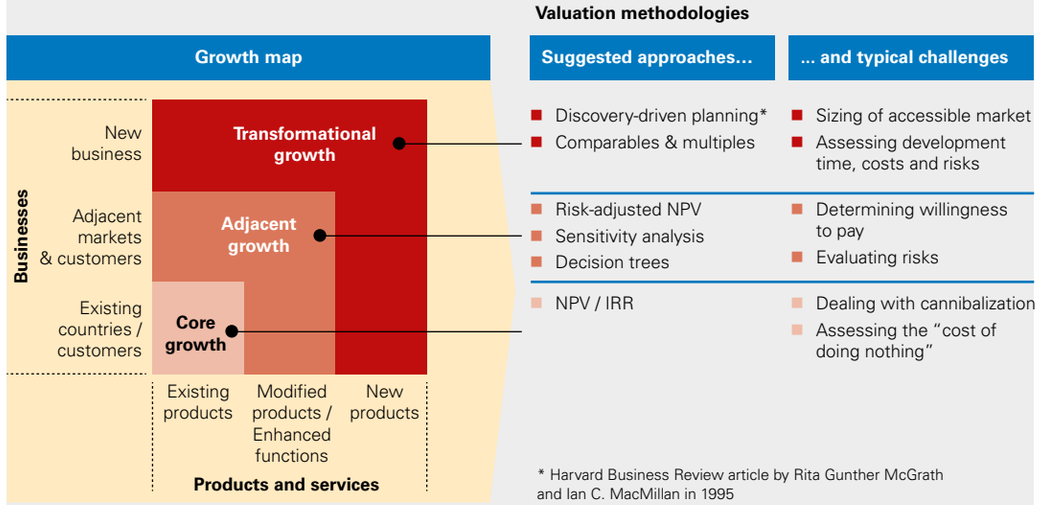


Table 6 **Matching valuation methodologies to varying levels of risk and uncertainty**

Source: HBR, adapted and developed by Arthur D. Little

Core growth areas: NPV and IRR

Most companies need to defend and grow their core activities by launching improved products in order to cater to known needs of existing customers. Development costs, time to market, product volumes and price points can typically be forecasted fairly precisely, and normal financial evaluations based on discounted cash flows (DCF) can be applied, such as NPV (Net Present Value) and IRR (Internal Rate of Return). Even so, great care must be taken to consider cannibalization and the "cost of doing nothing", as explained in point 3 above. We note in passing that the boundary with the next category (adjacent growth) is somewhat blurred and that most companies do not include the full NPV value for projects early in their pipeline.

Adjacent growth areas: Risk-adjusted NPV, sensitivity analysis, decision trees

As we have seen above, companies increasingly need to grow beyond their existing core, developing opportunities in selling modified or enhanced products and services and/or to adjacent markets and customers. Given their intrinsic uncertainties, simply applying DCF calculations to such business cases will usually yield flawed results. Many companies therefore apply a probability-related discount factor, for which a robust and calibrated assessment of the probability of success during development and after product launch is required. Some companies use standard check-lists for this, others have more sophisticated databases of similar projects in the past to which new opportunities can be compared. In any event, it is essential that business cases are not represented

as a single number, but are accompanied by sensitivity analyses on key assumptions, and also show the results of possible alternatives in development or launch (for instance, using probability-weighted decision trees). Decision tree approaches are also useful for investments in platform developments with multiple applications, although care has to be taken that the methodology does not become too labor intensive.

Transformational growth areas: Discovery-driven planning, comparables and multiples

Transformational growth opportunities, on the other hand, typically defy any of these approaches. In fact, applying any kind of financial formula to whatever quantitative information is available typically makes the problem even bigger by taking away transparency and suggesting spurious accuracy. Innovation teams are much better off discussing business assumptions (such as minimal required market sizes) directly, an approach that has been referred to as Discovery-driven planning[4]. Rather than try to predict a discrete valuation, this approach assumes a minimum acceptable valuation for viability, and sets about clarifying and validating the assumptions that would need to be met for this to be realized. If it is proved that a key assumption is impossible to meet, then the project is killed. Interactive approaches can be used to elucidate the relevant assumptions and how various value parameters relate to them.

From a portfolio valuation perspective, this will only yield a range of values until the definition level is developed sufficiently to enable greater accuracy. Under such circumstances it often proves valuable to evaluate the opportunity by comparing it to what companies and investors have paid for comparable technologies and resembling market applications. This can be useful even if the resemblance is limited. For example, we have seen situations where project teams insisted that an opportunity was worth at least many tens of millions of dollars, but we could show that no Venture Capital fund had ever paid more than $10 million for similar types of technology.

Companies should resist the urge to simply add up the expected returns from these parts of the Growth Map to arrive at an overall estimate of the value of their portfolio. Though there are some useful approaches to doing so (such as by looking at historical cost-benefit results, or through regression analyses), these are always based on large comparability assumptions (between past and future results and between different types of R&D projects) which make them useful only in specific circumstances.

[4] "Innovation Killers: How financial tools destroy your capacity to do new things" HBR 2008

Insights for the executive

With spend on innovation and R&D increasing every year, and with a greater proportion of that investment going to more uncertain breakthrough and long-term innovation, the pressures on companies to optimize their management of their 'Return On Investment' of innovation are intense. However, estimating and reporting the value being delivered by innovation investments remains challenging. Doing it badly can lead to problems such as long-term/radical projects being stifled, poorly-performing projects failing to be killed early enough, and strategically important capabilities being damaged through inappropriate cuts. Companies can overcome these challenges by taking account of four key factors for success:

1 Articulate precisely your objectives in managing ROI

Consider carefully your management objectives by considering two lenses to view the portfolio: Lens 1 (Realizing ambitions), which requires clarity on targets, strategic objectives and roadmaps; and Lens 2 (Optimizing value) which requires a balanced set of portfolio measures.

2 Clarify accountabilities and governance approach

Put in place clear accountabilities and governance systems for managing ROI, such as empowered cross-functional bodies, single-point responsibilities for valuation and suitable Control functions in order to ensure consistency of approach.

3 Take account of cannibalization and the "cost of doing nothing"

Ensure that the value impact of new innovations on existing core business is properly considered, both in terms of possible competition with core products, and potential deterioration of core business if the innovation is not implemented.

4 Use consistent logic and match valuation methodologies with levels of risk and uncertainty across the portfolio

Use ‘single truth’ key data sources, consistent methods, shared ownership across functions, post-launch feedback, and tailor the approach to the scale of the investment. Use assumption-focused approaches such as Discovery-driven planning to cover high uncertainty parts of the portfolio, and use external comparisons as reality checks.

Of course, managing the ROI of Innovation is in itself not enough to guarantee good business performance. Innovation success depends on having in place a comprehensive, integrated innovation management approach that covers several key ‘building blocks’[5]. However, we have found that companies who manage the ROI of Innovation well consistently outperform others in the quality of their decision making, in the predictability of innovation results, and in getting the most out of their innovation spend.

[5] Prism S1 2013 ‘Getting a better return on your innovation investment’

Michaël Kolk
is a Partner in Arthur D. Little’s Amsterdam office and a member of the Technology & Innovation Management Practice.

Rick Eagar
is a Partner in the London office of Arthur D. Little and a member of the Technology & Innovation Management Practice.