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controlling practices are required that capture the essence of innovation. In this article, we look at the practical valuation implications of this shift.

INNOVATION IS TODAY'S MAIN VALUE DRIVER

In 2002, the Paris-based organization EIRMA (European Industrial Research Management Association) conducted a best practice study looking at R&D Effectiveness amongst its members. These make up the organizations that make up the majority of the CTOs of the European industry. This study identified the need to look at R&D expenses as inputs in a value creation process, with the ultimate outcome being new business. The participants in this study concluded that looking at R&D spent, as an investment in future business, trumps the view where R&D is seen as a cost of current business. This is in line with market transactions, such as Pfizer putting a 31 billion dollar value on Pharmacia's patents in 2003, or the 8 billion dollar value paid for Skype by Microsoft in 2011 for the platform and its community.

INNOVATION AS AN INVESTMENT PORTFOLIO

The "innovation as an investment" view, while conceptually appealing, is not without complications. The main

Controlling the right value of innovation

The growing importance of innovation requires new ways to value the R&D asset and project portfolio. Novel tools offer the right combination of actual costs, risks, and business case forecasting to do this. This leads to improved decision making about innovation as investment.

In a recent global survey of 246 CEOs, PwC found that 97% of CEOs see innovation as a top priority for their business [*"Unleashing the power of innovation"*, PwC, 2013]. Add to this the turbulence that can cause large companies such as Kodak to disappear as quickly as new giants like Facebook emerge. In today's world, the value of a company is more than ever

Definition of innovation

► An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. [Diffusion of Innovations, Rogers].

determined by how future-proof it is. The question is no longer what we have done, but how we can maintain growth and adaptation? In other words, does our company have the right innovation capabilities? In line with this fundamental change, new management and

Overview of the typical innovation asset valuation approaches

Method	Definition	Benefits	Drawbacks	Example
Cost-based	The asset is valued at the historical costs of acquiring or developing the asset	Based on historical, factual data	Looking back; still requires price or value-based depreciation and impairment scheme	Activation or amortization of development projects
Price-based	The price of the asset on a market for such assets	Based on economic and accounting principle of fair market value	Limited to assets for which a market exists	Fair market value of patents, market value of New Chemical Entity in pharma pipeline
Value-based	The expected future value derived from the asset	Value aligns with importance	Business case required	(Expected) Net Present Value of future cash flows

management tool to assess an investment is the business case, where the investment is linked to its future financial benefits (such as additional profits, cost savings and hence cash flows).

The long time horizons, the typical uncertainties around new business, and the intangible nature of the assets make an innovation's business case tough to forecast and to manage. Let us first have a look at the latter: the intangible nature of the assets involved. These include a wide range of organizational routines, brand awareness, knowledge (both tacit and explicit), as well as more specific assets such as computer programs and databases, patents, and other Intellectual Property Rights (IPRs).

Like any other, innovation assets can be valued with three different valuation techniques each with their own merits and drawbacks, as listed in the Table "Overview of the typical innovation asset valuation approaches".

As already indicated in the definition, innovation is about newness, so it contains inherent uncertainties. Technological uncertainty is about whether the idea can really be turned into a working product or service, which may or may not generate value in use: the commercial uncertainty. The right indicators need to be used to assess their value where individual projects have these uncertainties. More importantly, the

hedging of risk at the portfolio level is an important executive management responsibility.

One way of reducing risk is widening the search for innovation input and commercialization beyond the company boundaries. First named "Open Innovation" by Henry Chesbrough [*Open Innovation, The New Imperative for Creating and Profiting from Technology*], Chesbrough, 2003], this more transparent view of the innovation funnel also implies that value can be more easily assessed for intermediate assets.

In open innovation, agreeing on the value of innovation assets such as patents and other IPR is critical to business. The multitude of choices to use individual patents and their bundles offensively (from exclusive exploitation via sales or licensing to cross-licensing and pooling) and defensively (in protecting freedom to operate, increasing entry barriers for competitors, to downright litigation) makes a value-based assessment of the portfolio necessary to compare all decision options.

Summarizing the ingredients of a good R&D valuation approach:

- Allocation of time spent and costs incurred to individual research and development projects and assets created (activity-based costing);
- Having a business case that forecasts the expected value for these resulting intangible assets of each project (over the

right future time period);

- Explicit tracking of the technological and commercial risks for each project and across the portfolio;
- Progressive updates of the above data as an input for explicit decisions about the project portfolio.

THE ACCOUNTING PERSPECTIVE ON INNOVATION ASSETS

The financial reporting landscape is also driving the adoption of this concept for R&D valuation. The International Accounting Standard (IAS) covers the accounting rules for innovation assets in IAS 38, which "requires an entity to recognize an intangible asset, whether purchased or self-created (at cost) if, and only if [IAS 38.21] it is probable that the future economic benefits that are attributable to the asset will flow to the entity and the cost of the asset can be measured reliably. This probability of future economic benefits must be based on reasonable and supportable assumptions about conditions that will exist over the life of the asset. [IAS 38.22] The probability recognition criterion is always considered to be satisfied for intangible assets that are acquired separately or in a business combination. [IAS 38.33]."

A further key requirement is to expense the research stage related costs, as opposed to the development costs, which are defined to be incurred after proof of technical and commercial feasibility. This is where

the accounting rules fully align with the management need for building the business case around each innovation. With a proper business case, the value created by the innovation can be assessed through a number of related indicators that derive from the cash flow forecasts around the innovation (see table "Value creation indicators derived from the business case").

Searching for the best indicators of value captured from innovation, the consultants of Booz Allen Hamilton ran an annual analysis of the "Global Innovation 1000". According to author Barry Jaruzelsky of the 2006 edition: "There are no significant statistical relationships between R&D spending and the primary measures of financial and corporate success. [...] Only 94 of the 1000 produced a significantly better performance per R&D dollar over a sustained period". These high achievers include Google, Toyota, and Apple, and they stand out by having "built sufficiently strong capabilities in all four links of the value chain: Ideation, Project Selection, Product Development, and Commercialization. A disciplined stage-gated decision-making process is one of the cornerstones of this value chain.

With the clear need to manage innovation as an investment process, it requires support to build and analyze the business cases and their value.

▶ Together with the strategic priorities of the company, these analysis results will provide input for the executive innovation decisions. These decisions include which projects to start as well as which projects to stop. This decision-making step is the innovation portfolio management process, where the allocation of resources (R&D staffing, budgets, and management attention) is made to optimize value creation. Around these requirements for management and accounting information, a new class of tools is emerging.

IMPLEMENTING A VALUATION DISCIPLINE WITH THE RIGHT TOOLS

The unique combination of tracking past time spent and costs incurred for each project (looking back) as well as building and updating a business case of future benefits under explicit uncertainties (looking forward), makes these tools much more than reporting tools. They provide analysis capability that links to portfolio decision support.

In order to support portfolio decision-making, the tool must cover the tracking of costs, the analysis of indi-

Value creation indicators derived from the business case		
Value Indicator Type	Indicator Name	Definition
Absolute	Net Present Value (NPV)	Sum of all (positive and negative) cash flows discounted to the present
	Risk-Adjusted NPV	Sum of all cash flows adjusted for their probability of occurrence and discounted to the present
	Real Option Value (ROV)	Analytical or simulated value of all cash flow variations and their probabilities (using decision trees, Black-Scholes analysis or Monte Carlo simulation)
Relative	Internal Rate of Return (IRR)	Annual return percentage on the cash flows seen as an investment (calculated as the discount rate for which the cash flows would have a zero NPV)
	Modified Internal rate of Return (MIRR)	IRR adjusted for issues, such as a more realistic reinvestment rate of positive cash flows
	ROI	Quotient of total value created over upfront costs (NPV/discounted total cash out)
Time-related	Payback time	Time period after which the cumulative cash flows turn positive
	Discounted Payback time	Time period after which the cumulative discounted cash flows turn positive
	Time to Cash Positive	Time period after which the cash flows turn positive (the business case no longer needs funding)

vidual business cases and the portfolio-level consequences in a reliable and traceable way. The need to link workflow and decision support, and to combine individual project business cases goes well beyond the simplicity of a spreadsheet solution. Modern tools (www.flightmap.info) address these requirements, and allow the various valuation indicators to be computed from a consistent

and up-to-date source. At B-core, we were actively involved in the EIRMA work mentioned earlier, and we have developed business cases for innovation projects for more than a decade. Our FLIGHTMAP software platform captures this experience.

However the most important benefit of a well-supported process may be the common language it creates about innovation as an investment. As the portfolio board at DAF Trucks, one of Europe's leading truck manufacturers, states: "The embedding of FLIGHTMAP helps our [Product Development] portfolio approach much further, by creating transparent analyses of cost and benefits". This has instilled a common language about innovation as an investment, between R&D, marketing, fiscal (*Credit d'Impôt Recherche*) and controlling experts. This in turn enabled the decision-making capability that will ultimately determine the successful companies of the future. ●



© DR The view of the innovation funnel as generated by FLIGHTMAP. Each bubble corresponds to one innovation project. The size of the bubble represents its value and its position the stage in the process.