

Designing and managing innovation portfolios

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16 Sept 2019

Question

What different approaches and models are there for designing and managing innovation portfolios in public and private sector or non-profit organisations?

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1. Overview

This rapid literature review summarises the existing evidence on the design and management of innovation portfolios of organizations from the private sector, public sector and NGOs. This report provides a review of academic papers, policy briefs, and other reports on the topic.

The design of innovation portfolios can be based on different models. Some of the most important approaches include **Innovation Ambition Matrix**, **Innovation life cycle portfolio model**, **Impact-feasibility portfolio model** and **Options portfolio model**.

- The '**Innovation Ambition Matrix**' is a classic model that helps organizations decide how to fund different growth initiatives. It identifies three different layers of innovation, from incremental to disruptive. Specifically;
 - '**Core**' innovation is an incremental innovation on an existing product/service portfolio.
 - '**Adjacent**' innovation is where a company, for example, modifies an existing product and sells it among a new customer segment.
 - '**Transformational**' initiative is where a company looks for building new assets and develop new markets.
 - For instance, **USAID** invests **70-90%** of its innovation on **core** and **adjacent** innovations and **10-30%** in **transformative** innovations.
- The **Innovation life cycle portfolio model (funnel)** provides a structure for thinking about the **generation and screening of alternative development options** and combining a **subset of these into a product concept**.
 - For example, the US Centers for Medicare and Medicaid Innovation (**CMMI**) follows a potential innovation selection system (i.e. Pioneer Accountable Care Organization) where it **picks the most efficient projects/proposals** and **scales them up** for wider use at the end of the pilot stage.
- According to the **Options portfolio model**, innovation projects with a high degree of uncertainty should be viewed as 'options' - since they are tickets to possible future markets or technologies.
 - **Positioning options** are innovation projects with a high degree of technical uncertainty but only a low or medium degree of market/financial uncertainty.
 - **Scouting options** are innovation projects which are feasible, but for which the commercial success is unclear.
 - **Stepping-stone options** are innovation projects with both a high market uncertainty and a high technical uncertainty.
 - The U.S. Department of Energy, for instance, wants to update its innovation portfolio model – where it wants to considerably increase expenditures on high-risk, radical power technologies.
- An organization selects a mix of innovation projects based on their overall potential impact and probability of success in the **Impact-feasibility portfolio model**, and then continually evaluates its portfolio using the 'return-on-investment' analysis.
- Targeting a **good balance of core, adjacent, and transformative innovation is a necessary step towards successfully managing a total portfolio of innovation**.
- **Traditional financial metrics are suitable for core or adjacent initiatives**. But using such measurements in transformative efforts too early can destroy potentially interesting ideas.

For example, calculations of **Net Present Value (NPV)** and **Return on Investment (ROI)**, widely used to evaluate core and near-adjacent projects, necessitate assumptions about adoption rates, price points, as well as other crucial variables – which, in turn, require customer input. For products or services that have not yet been on the market, such information is difficult to obtain.

- Most **innovation portfolio design and management models** in the literature are built around the **private sector**. However, most of these models can also apply to the **public sector or NGOs**, albeit with some changes.
- UNICEF, for instance, gives due position to **innovation and innovation portfolio management. Innovation is put alongside other major implementation modalities** such as capacity development, evidence generation and service delivery – as indicated in its strategic plan, 2014-2017. However, the organization has noted some difficulties in creating a conducive environment for innovative work. **Main barriers to innovation at UNICEF included:**
 - **risk aversion and difficulties of funding innovative projects** - because of external donors who want 'quick results' and prefer investments in known/less risky areas.
 - **Lack of willingness from staff to do new things – due to comfort in known mode of operation, as well as limitations in staff capacity and time**
 - Other challenges include worry about '**government buy-in**' and internal **bureaucratic hurdles** (i.e. an administrative process that is less inviting to innovation).

2. Designing innovation portfolios

Private businesses handle “innovation”¹ as an “investment portfolio”² and continually improve their successful products or services and deliver it to markets. Unlike firms in the private sector, many organizations in the public sector do not actively try to keep an edge through innovation. Further, financing streams in public organizations are often decentralized across different offices or divisions. Radical or "Big bets" are, therefore, often managed either at the level of the organization or through a committed internal group. Meanwhile, the most impacted offices or divisions, or the IT department of the organization, often initiate and manage incremental or more near-term operational developments. Consequently, this can usually only be done by those public sector organisations that are intentional in adopting a portfolio-driven strategy (Holden et al., 2018).

According to Holden et al. (2018), **portfolio-driven innovation strategy can assist organisations in the public sector to:**

¹ Nagji and Tuff (2012) define innovation as "a novel creation that produces value." Innovation encompasses much more than invention because it signifies generating a concept - then transforming the concept into a product, a fresh company model, marketing strategy and finally implementing it effectively internally or on the market (Goffin and Mitchell, 2010; Gewers, 2015).

² Innovation Portfolio or Innovation Portfolio Management (IPM) is an instrument for converting strategic goals into project-based innovation operations. Based on the level of risk, innovation portfolio also offers a structure for transforming rough thoughts into true investment options. Multiple resources are often used to invest in innovation portfolios. It should be observed that innovation portfolios are not only for product development alone, but also for process, service and business model development attempts of organizations (Vizologi, 2018). <https://vizologi.com/what-is-innovation-portfolio/>

- Monitor the impact of technologies that are readily introduced while exploring future disruptive technologies at the same time;
- Validate the adoption of longer-term, higher-risk projects as they are offset by more specific projects in the short term;
- Optimize budgets for innovation and justify demands for budgets; and
- Make sure that attempts to innovate are complementary but not redundant to each other.

Many tools are present to develop a healthy risk-return equilibrium in an organization's innovation portfolio. Each of these models provides insights into a unique combination of innovation portfolio to define future investment areas.

2.1 Innovation Ambition Matrix model (classic model)

The **Ambition Matrix is a well-established approach for portfolio-led innovation management**. Nagji & Tuff (2012) discuss, in their much-cited article, the matrix by which they evaluate a portfolio of projects on the basis of their solution's *newness* (x axis) and *market* (y axis). The Ambition-matrix is shown in the following figure.

See: Figure 1: The 'Innovation Ambition Matrix', Nagji & Tuff (2012: 7), <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/strategy/us-managing-your-innovation-portfolio-07102013.pdf>

Core innovation projects are in the activity group at the bottom left of the matrix, i.e. efforts to make **incremental³ adjustments to current products** and incremental inroads into new markets. Whether in the form of fresh packaging, slight reformulations or added ease of service, such innovations are based on resources already in place by the business (Nagji & Tuff, 2012).

Transformational⁴ projects are at the reverse corner of the matrix, intended to generate fresh offers, i.e. to serve new markets and clients. These are the type of technologies that make headlines when successful (e.g. iTunes, the Tata Nano, and the in-store experience of Starbucks). These kinds of developments, also referred to as **breakthrough, disruptive, or**

³ Schilling (2013) define incremental innovation as "An innovation that makes a relatively minor change from (or adjustment to) existing practice." Goffin and Mitchell (2010) define it as "Small changes to existing products." Incremental innovation deals with low risk and instant benefits (Dougherty and Hardy, 1996) and can be managed easily (Tidd and Bessant, 2009). For incremental innovation, standardized procedures are useful (Khurana and Rosenthal, 1998). Incremental innovation's assets are often assets already internal to a business (Nagji and Tuff, 2012). It usually involves small changes to existing products and is more efficient and cheaper (Goffin and Mitchell, 2010).

⁴ Transformational/radical innovation is defined by Schilling (2013) as "An innovation that is very new and different from prior solutions." It is defined by Goffin and Mitchell (2010) as "Create new markets of completely change existing ones." A considerable amount of uncertainty must be managed by radical innovation (O'Connor and McDermott, 2004) and too much standardization can damage radical growth (Johnstone et al., 2011). Radical Innovation can also be defined as risk-taking (Schilling, 2013) and generally involves fresh knowledge-building, which is also called 'exploratory innovation' for that reason (Busco et al., 2012; Schilling, 2013). The prospective result is generally fresh goods or new markets – which can alter current markets or clients entirely (Goffin and Mitchell, 2010; Schilling, 2013). On the other side, as the market becomes acquainted with it, the radical nature of a product decreases over time (Schilling, 2013).

game-changing, usually require the business to call on unfamiliar assets. This may involve, for instance, building capacity to obtain a deeper knowledge of clients, communicating about goods without a direct background, and developing markets that are not yet mature (Nagji & Tuff, 2012).

Adjacent innovations are in the centre, which can **share features with core and transformational innovations**. An adjacent innovation includes leveraging into a fresh market a product or service that the business is doing well. The 'Swiffer' from Procter & Gamble (P&G), for instance, is a case in point. It came from a catalogue of customer requirements that P&G knew well, i.e. that a long-handled mop is the right instrument for cleaning floors. However, a fresh technology was used to bring the product and idea to a fresh set of customers and create fresh income streams. **Adjacent innovations enable a business to rely on current capacities but require fresh uses of those capacities**. They require understanding of trends in demand, market structure, competitive dynamics, technology, and other market factors (Nagji & Tuff, 2012).

On average, **high performing firms direct 70% of their innovation resources to enhancements of core offerings, 20% to adjacent opportunities, and 10% to transformational initiatives** (see table below). But individual firms may deviate from that ratio for sound strategic reasons. Here are the exemplar allocations (that derive from the research by Nagji & Tuff, 2012) for firms in various circumstances.

See: Table 1: Alternative breakdown of innovation investment, Nagji and Tuff (2012: 9), <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/strategy/us-managing-your-innovation-portfolio-07102013.pdf>

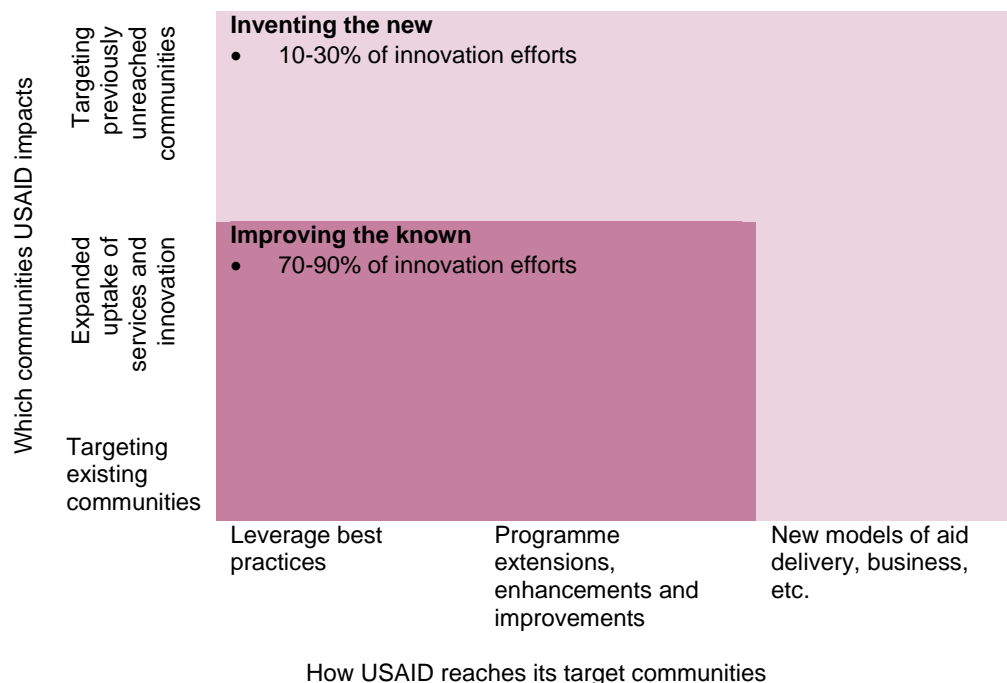
Industrial companies that were studied by Nagji & Tuff **had a strong portfolio of innovations**. These manufacturers come the nearest to the 70-20-10 innovation portfolio mix.

- **Technology firms spend less time and money on enhancing core products** since they are keen for the next hot release on their market.
- **Manufacturers of packaged products have little activity at the transformational stage since incremental innovation is their primary focus.**
- Collectively, **industrial manufacturers have the largest Price-to-Earnings (P/E) ratio compared to other firms**, implying perhaps that they are closest to achieving the correct equilibrium.
- The **competitive position of a company within its sector also affects the equilibrium**. A **lagging business, for instance, may want to pursue more high-risk transformative innovation** in the hope of generating a truly disruptive product or service that would dramatically change its growth curve. In the late 1990s, a struggling Apple took this choice, successfully betting on several courageous projects, including its iTunes platform.
- A **business that wishes to maintain its leadership position** or thinks that the market has cooled down for its more ambitious innovations may decide to do the opposite, **reducing some risk from its portfolio by shifting its focus from transformative to core projects**.
- Another key factor is the **development stage of a company**. **Early-stage businesses need to create a big splash**, particularly those financed by venture capital. They may feel that a disproportionate investment in transformative technology is warranted, both in order to attract media attention, investors and clients, and since they still do not have much to build on. As they mature and create a stable client base, and as the protection of the core becomes more essential, they can change their focus to that of a more established business.

Public sector organisations should invest in all three kinds of innovation just like firms in the private sector. Instead of marketing, however, organizational mission should drive the amount of ambition of a public sector organization and the composition of its portfolio. For those organizations where the task/mission is transformative by its very nature (for instance, NASA projects), more resources would be expected to be dedicated to greater levels of ambition (Holden and others, 2018).

USAID's Global Health Bureau is one instance of a government organization that manages its innovation initiatives using an Ambition Matrix portfolio structure (see figure below). With more than 150 technologies financed in 2018 and 25 transitioning to scale, the agency needs to stay disciplined in balancing its investments in more cutting-edge alternatives and methods. It invests 70-90% of its innovation attempts in "improving the known" solutions— which could be categorized as core and adjacent innovations— and 10-30% in "inventing the new" or transformative innovations (USAID, 2018; Holden et al., 2018).

Figure 2: The 'Innovation Portfolio' of USAID



Source: Adapted from USAID (2018), <https://www.usaid.gov/sites/default/files/documents/1864/impact-brief-2018.pdf>

2.2 Innovation life cycle portfolio model (Innovation Funnel)

A second option is to **organize a portfolio of innovations around the life cycle of innovation itself**. Ideally, **innovation should operate as a funnel, filtering ineffective ideas through each consecutive phase of the innovation process - until only the best is scaled** (see figure below). Many organisations in the public sector lack the resources to create, pilot and scale an endless amount of excellent ideas. Therefore, these organisations often need to allocate funds to help each of these stages. These resource constraints can enable an organisation to select a project portfolio based on maximizing the funnel's throughput. Imagine an organisation having the funds over the course of six months to scale two alternatives. Therefore, it should only scale

four alternatives in one year. By investing in a "balanced" portfolio of projects based on their maturity in the life cycle of innovation, the organization can maximize the use of its resources and ensure that the right number of innovation solutions are available throughout each phase (Holden et al., 2018).

See: Figure 3: Innovation life cycle, Lal, B., Gupta, N. and Weber, C. L. (2012: 3), <https://www.ida.org/-/media/feature/publications/p/pi/pipeline-management-lessons-learned-from-the-federal-government-and-private-sector/d-5367.ashx>

The US Centers for Medicare and Medicaid Innovation (CMMI) is implementing a strict method to guarantee that its innovation investment portfolio is balanced across the innovation life cycle development phases. CMMI has introduced a Pioneer Accountable Care Organization (ACO) that invites proposals to provide better care to beneficiaries for innovative payment systems from suppliers. After a strict review procedure, 18 months are provided to a select group of these ACOs to implement their thoughts on a small scale, after which both claim information and quality measures are assessed. The most efficient alternatives are scaled for wider use at the end of the pilot stage. CMMI utilizes strict timelines and assessment structures to enable the organisation to handle its pipeline throughout the innovation life cycle. (Holden and others, 2018)

2.3 Impact-feasibility portfolio model

A third **alternative option to organizing a portfolio of innovations is to focus mainly on investment returns**. In this model, an **organisation chooses a mixture of innovation projects based on their general prospective effect and likelihood of achievement**, and then **continuously evaluates its portfolio using return-on-investment analysis** (see figure below). A **potential benefit of such a model is that it forces a real evaluation of viability and impact**, rather than relying solely on the "newness" of a problem area and solutions, i.e. as the Ambition Matrix does. (Holden and others, 2018)

See: Figure 4: Impact-feasibility portfolio model, Holden et al. (2018: 10), https://www2.deloitte.com/content/dam/insights/us/articles/4727_Innovation-portfolios/DI_Innovation-portfolios.pdf

The Gates Foundation takes a portfolio strategy to innovation that blends aspects of the Ambition Matrix and a more functionally oriented model in its plan to invest US\$ 1.7 billion to improve the U.S. education system over the next five years. In an October 2017 lecture, Bill Gates outlined how he intends to allocate 25% of the financing to large bets or technologies "with the potential to change the trajectory of public education over the next 10 to 15 years." including studies, technology apps, or "promising developments in neuroscience, cognitive psychology, and behavioural economics." 15 % of the resources would go to charter schools and the remaining 60 % would be dedicated to creating school "networks" that could partner in sharing information and serving the requirements of the children together. (Holden and others, 2018)

2.4 Options portfolio model

Some portfolio models are constructed using a structure comparable to the Ambition Matrix, but with additional elements of complexity and insight. For instance, there are five kinds of innovation projects, **according to the study by MacMillan and McGrath (2016), three of which would fall into the Ambition Matrix's "transformational" category - namely,**

positioning, scouting, and stepping stone options projects (see Figure below). (Holden et al., 2018)

In the model of MacMillan & McGrath, **organisations can choose to invest in less certain projects - depending not only on their anticipated comparative probability of success, but also on what the organisation hopes to learn from the investment** (Holden et al., 2018).

See: Figure 5: The 'Option portfolio model', Holden et al. (2018: 9), https://www2.deloitte.com/content/dam/insights/us/articles/4727_Innovation-portfolios/DI_Innovation-portfolios.pdf

- **"Investment positioning"** may be **useful when there is a high amount of uncertainty about the organization's capacity to produce a realistic solution**, but it has a high degree of confidence in the need to tackle a set of evolving threats or opportunities. In the private sector, positioning alternatives are investment not only in an uncertain solution, but also in order to obtain data on the prospective route forward for uncertain techniques and retain market significance. In the public sector, even if a project does not attain its initial objective, a positioning project is an investment that produces understanding that is essential for determining the viability of certain projects and for deciding whether to make further investments. (Holden et al., 2018)
- **"Scouting options" provide market-related data and client requirements.** In the private sector, **scouting options often require provisions of prototypes to early adopters** to know more about market requirements. Investments in scouting options in the private sector can assist organisations to better understand how evolving trends or technologies could affect their activities and their engagements with end-users. (Holden et al., 2018)
- **"stepping-stone investments"**, on the other hand, are relatively small explorations that can lay the basis for understanding advanced problems and provide data to inform the future innovation strategy of the organization. (Holden et al., 2018)

The fine distinction of the **portfolio option model** is that **investment can be justified not only on the basis of the degree of uncertainty/risk, but also on the basis of what the organisation hopes to learn from the investment in technology.** This may allow an organisation to move an even higher amount of resources to less-certain attempts, as the value they provide extends beyond the ROI of the solution itself to include expertise acquired that can be used to move forward. (Holden et al., 2018)

The U.S. Department of Energy utilizes a combination of risk and time horizon strategy to assess financing streams across its portfolio of innovations. In its 2018–2022 Energy Innovation Portfolio Plan, the agency points out that in 2016, just over 6% of power innovation funding (i.e. US\$291 million) was dedicated to ARPA-E, an entity specifically set up to promote high-risk, radical power technologies that is modelled after the Defense Advanced Research Projects Agency (DARPA). The plan calls for a rise in ARPA-E financing of 244 % to devote more funds to high-risk initiatives, representing an attempt to better balance the risk and time-horizon profile of its portfolio of innovations. (DOE, 2017; Holden et al., 2018)

3. Managing innovation portfolios (strategies, systems & challenges)

3.1 Innovation portfolio management (the decision-making process)

As companies need a constant stream of technologies to survive, they need to set up a continuing decision-making process to manage their development initiatives. Firms do this by implementing Innovation Portfolio Management (IPM), a dynamic decision-making process that assesses, chooses and prioritizes innovation projects in order to accelerate, stop or reprioritize them and thus allocate resources to them. (Kester et al., 2011; Rothaermel, 2012; Cooper, 2001)

- IPM research suggests that **formalized, cross-functional IPM procedures enable organisations to attain better efficiency** than would be possible with less structured IPM procedures (Markham and Lee, 2013).
- As with organisational control systems, IPM procedures are put in place in order “to align employee capabilities, activities, and performance with organizational goals and aspirations” (Sitkin, Cardinal, and Bijlsma-Frankema, 2010, p. 3).
- **IPM control systems not only define the roles and responsibilities of the stakeholders, but also specify the processes, structures and methods required to govern the IPM decision-making process** (Cooper et al., 2001). In the literature, IPM's process design is investigated in order to comprehend the determinants and techniques assumed to align individual conduct with portfolio strategic alignment, equilibrium and value maximization (Carbonell and Escudero, 2016; Cooper et al., 2001; Kang and Montoya, 2014; Spieth and Lerch, 2014; Urhahn and Spieth, 2014).
- **Clear responsibilities and transparent targeted accomplishments allow executives of distinct (hierarchical) backgrounds to collaborate efficiently on IPM** and guarantee its achievement (Beringer, Jonas, and Kock, 2013; Schultz, Salomo, De Brentani, and Kleinschmidt, 2013).
- Kock and Gemünden (2016) demonstrate that IPM procedures which are characterized by strategic clarity, process formality, a powerful control mechanism, an innovative and risk-conscious climate improve decision-making quality. That, in turn, has a positive impact on IPM agility.
- Kester et al. (2011) qualitative research explores how efficient IPM choices are made in terms of agility, portfolio thinking and focus. They demonstrate that **efficient IPM choices are the outcome of rational portfolio decision-making processes**. To test this conceptual model, Kester et al. (2014) demonstrate in their quantitative follow-up research that all three dimensions of IPM decision-making efficiency have a positive impact on IPM performance, which in turn determines the business performance of the organization.
- **The role of manager's disposition:** McNally, Durmusoglu, Calantone, and Harmancioglu (2009) show that a manager's disposition can explain the differences between IPM performance of companies. In a later quantitative research, the researchers demonstrate that the attitude of executives determines their assessment of IPM performance dimensions (value maximization, equilibrium, and strategic fit) and that IPM balance positively affects innovation project performance and firm efficiency (McNally, Durmuşoğlu, and Calantone, 2013).

- **Role of managers' experience and hierarchical level:** Experienced middle executives not only highlight the strategic context of an innovation project more than senior executives do, but also underline its uncertainty to a lower extent (Behrens, Ernst, and Shepherd, 2014). In addition to these insights into triggering innovation initiatives, the study also suggests that using consultant guidance and visual portfolio decision-making aids can decrease the tendency of executives to increase their commitment and continue to develop botched innovation projects (Behrens and Ernst, 2014).
- **Role of knowledge interdependencies:** Khanna, Guler, and Nerkar (2018) show that knowledge interdependencies among different innovation projects within a portfolio reduce the probability of terminating an innovation project. The authors depict this relationship as a consequence of the beneficial effect of knowledge interdependencies on a manager's cognitive burden and heuristic application while assessing innovation projects. Subsequently, current research shows that a behavioural perspective must supplement the formal design of IPM decision-making investigation. Such a perspective allows researchers to comprehend how decisions are made and how managerial non-rational behaviour affects IPM decisions.

3.2 Strategies for Innovation Portfolios

An innovation strategy forms part of the overall business strategy and decides where and when innovation should occur (Goffin and Mitchell, 2010; Schilling, 2013).

- **'Positioning'** – i.e. market orientation (Porter, 2008) and **'resource-based views'** – i.e. earning capacity of internal resources (Rothaermel, 2012) are two common approaches to the development of a strategy for portfolio innovation.
- Schilling (2013) suggests an innovation strategy that includes **defining the strategic direction of the organization, selecting projects for innovation, strategies for collaboration, and how to protect innovation.**
- Goffin and Mitchell (2010) suggest that the innovation strategy should **control organizational elements such as ideas, prioritization, implementation, and individuals and organization.**

3.3 Managing (and organizing) the Total Innovation System

Targeting a **healthy balance of core, adjacent, and transformative innovation is a vital step towards managing a total portfolio of innovation.** A company must be capable of delivering on all three levels of ambition in order to fulfil the promise of that balance (Nagji & Tuff, 2012).

According to Nagji & Tuff (2012), **Organizations that have managed their innovation portfolio carefully consider five key management areas** that fulfil the three levels of innovation ambition (i.e. core, adjacent, and transformative).⁵

⁵ See section 2.1 as well.

Funding

- **Core and adjacent innovation** efforts are mostly small-scale projects, which do not require significant cash fusions. They can and should be **financed through annual budgetary cycles** by the relevant Profit and Loss (P&L) unit. (Nagji & Tuff, 2012)
- Typically, **bold transformation efforts demand sustained** (and occasionally significant) **investment**. They **should be funded by a separate entity** (maybe the executive and ideally the CEO), which can exceed the annual budget allocation expenses (Nagji & Tuff, 2012).
 - Merck's Global Health Innovation venture fund, for example, is a distinct limited liability company that invests in important health care companies working on the fringes of Merck's core pharmaceutical, vaccine and consumer health enterprises. The main purpose of the fund is to place bets on the components of an evolving future business model for the corporation. It is also used at times to fund organic innovation projects, such as Merck Breakthrough Open, a crowdsourcing forum that seeks employees ' ideas for transformational growth opportunities (Nagji & Tuff, 2012).

Pipeline management

- Any **well-managed innovation process involves mechanisms to monitor ongoing initiatives and make sure that they are advancing as planned** (Nagji & Tuff, 2012).
 - Private businesses and public organizations typically rely on **stage-gate processes to evaluate projects regularly**, recalculate their projected **Return on Investment (ROI)** under any changed circumstances, and decide whether they should be given a green light (Nagji & Tuff, 2012).
 - **In the case of a core product extension, such insight is usually adequate**, i.e. Customers can say whether they would like the proposed product variant and, if so, how much they would be willing to pay for it (Nagji & Tuff, 2012).
 - **If the innovation initiative involves a completely new solution** (i.e. one that customers may not even know about), **traditional stage-gate processes are dangerous**.⁶ For example, it's hard to predict fifth-year sales for something the world has never seen before (Nagji & Tuff, 2012).
 - In other words, **transformational efforts are not generally managed using a funnel approach** (see section 2.2). They require a non-linear process in which potential alternatives remain undefined for a prolonged period (Nagji & Tuff, 2012).

Talent

- The **skills needed for core and adjacent innovations** are quite **different from** those needed for **transformational innovations** (Nagji & Tuff, 2012).
- For **core and adjacent innovations, analytical skills are vital**, because such initiatives call for market and customer data to be interpreted and translated into specific offering enhancements (Nagji & Tuff, 2012).

⁶ Such a process may, for instance, result in the refusal of promising options before they are properly explored (Nagji & Tuff, 2012).

- Procter & Gamble, for example, deploys 70 senior employees around the world to help identify promising adjacencies. These “technology entrepreneurs,” as the company calls them, are responsible for researching a variety of sources, including scientific journals and patent databases, and for physically observing activities in specific markets in order to find new ideas that can build on P&G’s core businesses. The company credits its technology entrepreneurs with uncovering more than 10,000 potential contributions/ideas for review (Nagji & Tuff, 2012).
- **Transformational innovation** efforts, by contrast, **typically employ a discovery and concept development process** to uncover and analyse the social needs driving business changes (i.e. what’s desirable from a customer perspective), the underlying market trends (i.e. what kinds of offers might be viable), and ongoing technological developments (i.e. what is technically feasible to produce and sell). (Nagji & Tuff, 2012)
 - For instance, Samsung moved its design centre from a small town in South Korea to Seoul in order to be closer to a valuable pool of young design professionals. It also teamed with several outside firms with strong design skills and created an in-house school, led by industrial design experts, to improve the abilities of designers who exhibited potential. As a result, Samsung has garnered numerous design awards while evolving from a manufacturer of nondescript consumer electronics to one of the most valuable brands in the world (Nagji & Tuff, 2012).

Integration

- Although the right **skills** are **critical, they must be organized and managed in the right way** to help them succeed. One of the most important decisions will be how closely to connect the skills and associated activities with the day-to-day business (Nagji & Tuff, 2012).
- In **most companies, most people engaged in innovation are working on enhancements to core offerings**. They’re most likely to succeed if they remain integrated with the existing business. Even **teams working on adjacent innovations benefit from the efficiencies that come with close ties to the core business** (Nagji & Tuff, 2012).
 - As Samsung’s move of its design centre suggests (see above), transformational innovation tends to benefit when the people involved are separated from the core business - i.e. financially, organizationally, and sometimes physically. Without that distance, they can’t escape the gravitational pull of the company’s norms and expectations, all of which reinforce an emphasis on sustaining the core (Nagji & Tuff, 2012).

Metrics

- **For core or adjacent initiatives, traditional financial metrics are appropriate**. But using such measurements too early in transformational efforts can kill potentially great ideas. For instance, **Net Present Value (NPV) and ROI calculations, commonly used to assess core and near-adjacent initiatives, require assumptions about adoption rates, price points, and other key variables** - which in turn require customer input. Such input is impossible to obtain for products or services that haven’t yet been on the market (Nagji & Tuff, 2012).
- **Historically, economic metrics (e.g. ROI) have been dominant**. However, through fresh views such as the Balanced Scorecard (BSC), other non-financial elements (e.g. customer

loyalty, worker skills, process quality, lead time, etc.) have been recognized as having at least the same effect (Lissinger & Jönsson, 2013; Kaplan & Norton, 1992). Also see figure below.

- **Financial metrics** are stated to be a causal consequence of past behaviour, thus a **lagging indicator of past results**, while some non-financial metrics can be used to forecast future results, i.e. leading factors. Another dysfunction of financial measures like ROI is that **they do not take any spillover effects into consideration. Measuring the specific ROI for a single project does not include synergies that could have been achieved through the project** but could be reflected for other projects in a higher ROI (Lissinger & Jönsson, 2013; Kaplan & Norton, 1992).
- The **experience of Google** has, for example, shown that **financial metrics may underestimate the value of some projects**. That is, for some **innovations the company may not 'earn' profits in the short term but may greatly 'learn from' them – securing its future success**. This has been Google's important lesson, especially on **transformational innovation projects** (Nagji & Tuff, 2012).
- **Innovation's unclear and complicated nature generates problems in selecting the correct metrics** (Källman & Sandqvist, 2012; Smith, 2006). This was also reflected in the 2009 Innovation Measurement Survey by Andrew et al. (2009). Not knowing what to measure was the most prevalent reason for companies not to improve the quantity of innovation measurement.
- **In a survey conducted on Swedish companies** (Källman & Sandqvist, 2012), **poor intracompany transparency and historical legacies** was stated as reasons for poor innovation measuring activity.
- Managers should discuss thoughtfully where economic and noneconomic metrics, along with external and internal metrics, are most appropriate. **Stage-gate systems operate at the intersection of economic and external metrics**. They estimate how much money the company will make when its innovation is launched in the outside world. **This combination is appropriate for evaluating core or near-adjacent initiatives** (Nagji & Tuff, 2012).

See: Figure 6: Traditional (financial) and non-traditional innovation measurements, Lissinger & Jönsson (2013: 26) adopted from Kaplan & Norton (1996), <http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=3807032&fileId=3807036>

3.4 Challenges while selecting and managing innovation portfolios

Working with **innovation is time consuming and costly** – as most project aren't successful in the end (Schilling, 2013). Therefore, organizations want to work with projects that maximize their possible outcome.

- However, **it's difficult to allocate resources between projects to gain maximized return on investment** (Goffin and Mitchell, 2010).
- Nagji and Tuff (2012) states that a **well-balanced portfolio can be the only way to get above-average returns**.

Goffin and Mitchell (2010) describe **three key challenges faced by organizations while designing/selecting and managing an innovation project portfolio.**

- The first is a **valuation problem**, i.e. identifying which projects are worth doing.
- The second is a **balance problem** while choosing a group of projects as the project portfolio. There should be a balance between high-risk and low- risk projects and the projects must fit the company's strategic needs.
- The third problem is the difficulty in having a **management process** that is open, and where all persons involved are committed to the projects and to the achievements of good results.

4. Case study: UNICEF's Innovation Portfolio Management

UNICEF: Innovation as a change strategy (Innovation portfolio management review; 2019)⁷

- UNICEF's **official stance on innovation is reflected in its strategic plans** for 2014-2017 and 2018-2021, both of which place innovation among the key approaches for achieving outcomes for children (UNICEF, 2019).
- In the strategic plan, 2014-2017 **"identification and promotion of innovation" appears to be one of many key implementation strategies**, while the strategic plans, 2018- 2021 recognises **"fostering innovation"** and "harnessing the power of business and markets for children" as enablers, or "how strategies".
- In the strategic plan, 2014-2017, **innovation is placed together with other major implementation modalities** like capacity development, evidence generation and service delivery. UNICEF delineated its role as helping to identify the most auspicious innovations for use in various contexts, supporting partners to adopt, adapt and scale up those approaches that are most valuable. The accompanying 'theory of change' (ToC) also emphasised the role of innovation - by identifying rapidly changing technologies and their broader impact on the lives of children as a 'key risk' that could deter UNICEF's progress toward its intended results.
- **Three measures were identified to alleviate this risk:**
 - Addressing innovation through an innovation unit systematically across the organization;
 - Continuous scanning of the external environment to spot technological changes that affect children's lives; and
 - Reviewing the evidence constantly to find new methods.
- The internal evaluation (UNICEF, 2019) found that staff do not yet fully perceive an enabling environment for innovative work. Global staff surveys carried out in 2017 and 2018 reveal that a little above half of respondents (57 % and 56 % respectively) agreed or strongly agreed that new ideas and innovations were supported in their offices.
- **Main blockades to innovation** (UNICEF, 2019; p. 100)
 - **Risk aversion:** "Innovation will fail most of the time, and UNICEF doesn't necessarily (or systematically) have a way of looking at failure as part of innovation. Can they reward failure? Encourage risks?"

⁷ https://www.unicef.org/evaldatabase/files/UNICEF_Innovation_evaluation_report_Digital.pdf

- **Funding:** “One of the biggest barriers is the funding for innovation here. Most of the money is from external donors and they want results quick, so there is a feeling that UNICEF needs to play it safe.”
- **Staff capacities:** “In many cases, UNICEF staff are not too willing to do new things and are more comfortable doing things in their tried and tested ways.”
- **Lack of time and space:** “Innovation is seen as an ‘additional’ thing to do, rather than part and parcel of what people are supposed to do – an extra.” “When? How? Ideas are there but no time or support has been given to that.” Furthermore, innovation needs longer-term time frames when it comes to product innovation, reaching scale or mainstreaming within a country programme.
- **Lack of understanding of innovation:** “At UNICEF there is no unified clear understanding of what innovation is. It is not institutionalized yet – and this is a huge problem.”
- **Bureaucracy:** “Administrative processes in UNICEF can stifle innovation. Everything has to be reported and audited, stringent planning processes, etc. These can put people off from innovating.”
- **Government buy-in:** “If a ministry is not receptive to UNICEF’s activities, then they can’t go very far.”
- **Key Recommendation from review of UNICEF’s innovation portfolio management:**
 - **Utilize a portfolio management approach for innovation:**
 - UNICEF has yet to **clarify how its unique structures and resources are optimally placed along the innovation and scale up spectrum** – whether to concentrate on existing, tried-and-tested technologies that need mainstreaming or to underscore those that require developing from early stages.
 - UNICEF should **use a portfolio management approach to make sure that its resources are well associated with its strategic priorities** and comparative advantages and tolerable degrees of risk. Such an approach should help alleviate or overcome the projectization or piecemeal organizational approach to innovation in which small sums of money, short funding cycles, high staff turnover and inadequate knowledge transfer are common.
 - **A portfolio approach should be employed in a manner where time and resources devoted to innovation initiatives are weighed accordingly.** Portfolio management should inform decision-making by classifying who is doing what in innovation across the organization, what resources are being spent and what results are being measured (UNICEF, 2019).

5. References

- Andrew, J. P., Haanæs, K., Michael, D. C., Sirkin, H. L., & Taylor, A. (2009). Measuring Innovation 2009: The Need for Action. BCG Report: The Boston Consulting Group. <https://www.bcg.com/documents/file15484.pdf>
- Behrens, J. (2011) Decision Making in Innovation Portfolio Management: An Experimental Paper Series. WHU - Otto Beisheim School of Management. https://opus4.kobv.de/opus4-whu/files/117/Behrens_Judith_WHU_Diss_2011.pdf
- Behrens, J., and H. Ernst (2014). What keeps managers away from a losing course of action? Go/stop decisions in new product development. *Journal of Product Innovation Management* 31 (2): 361–74. <https://doi.org/10.1111/jpim.12100>
- Behrens, J., H. Ernst, and D. A. Shepherd (2014). The decision to exploit an R&D project: Divergent thinking across middle and senior managers. *Journal of Product Innovation Management* 31 (1): 144–58. <https://doi.org/10.1111/jpim.12085>
- Beringer, C., D. Jonas, and A. Kock (2013). Behavior of internal stakeholders in project portfolio management and its impact on success. *International Journal of Project Management* 31 (6): 830–46. <https://doi.org/10.1016/j.ijproman.2012.11.006>
- Brentani, C. (2004). Portfolio management in practice. Burlington: Oxford. <https://doi.org/10.1016/B978-0-7506-5906-2.X5000-5>
- Busco, C., Frigo, M., Giovannoni, E. and Maraghini, M. P. (2012) Controll vs. creativity. *Strategic Finance*, pp. 29-36. [https://pure.royalholloway.ac.uk/portal/en/publications/control-vs-creativity\(e0965829-80ea-45b3-8011-4956b400b41e\).html](https://pure.royalholloway.ac.uk/portal/en/publications/control-vs-creativity(e0965829-80ea-45b3-8011-4956b400b41e).html)
- Carbonell, P., and A. I. R. Escudero (2016). The effects of decentralization in strategy-making and national culture on NPD portfolio planning. *Journal of Product Innovation Management* 33: 101–16. <https://doi.org/10.1111/jpim.12356>
- Cooper, R., Edgett, S., & Kleinschmidt, E. (2001). Portfolio management for new product development: Results of an industry practices study. *R&D Management*, 31(4): 361-380. <https://doi.org/10.1111/1467-9310.00225>
- DFID (2018) Adaptive management and innovation: Business Case. http://iati.dfid.gov.uk/iati_documents/8383682.odt
- DFID (2019) Adaptive management and innovation: Annual Review. http://iati.dfid.gov.uk/iati_documents/30050518.odt
- DOE (2017) Energy Innovation Portfolio Plan FY2018-FY2022. United States Department of Energy. https://www.energy.gov/sites/prod/files/2017/01/f34/DOE%20Energy%20Innovation%20Portfolio%20Plan%20FY%202018-22_0.pdf
- Dougherty, D. and Hardy, C. (1996) Sustained product innovation in large, mature organizations: overcoming innovation-to-organization problems. *Academy of management journal*, Vol. 39, No. 5, pp. 1120-1153. DOI: 10.2307/256994. <https://www.jstor.org/stable/256994>
- Ehrlich, E. (2011) An Economic Engine NIH Research, Employment, and the Future of the Medical Innovation Sector. http://www.unitedformedicalresearch.com/wp-content/uploads/2012/07/UMR_Economic-Engine.pdf

- Gewers, L. (2015) An Execution Plan for Managing Innovation in a Small High-Tech Company. KTH Industrial Engineering and Management. <http://www.diva-portal.se/smash/get/diva2:840179/FULLTEXT01.pdf>
- Goffin, K. and Mitchell, R. (2010) Innovation management: Strategy and implementation using the pentathlon framework. Palgrave Macmillan, England, 2nd edition, ISBN: 978-0-230-20582-6.
- Holden, A., Cassidy, J., Hallber, K. and Marsh, W. (2018) Developing innovation portfolios for the public sector. Deloitte. https://www2.deloitte.com/content/dam/insights/us/articles/4727_Innovation-portfolios/DI_Innovation-portfolios.pdf
- Källman, K., & Sandqvist, J. (2012). Book of Metrics, Edition 2012. Innovation Pioneers.
- Kang, W., and M. Montoya. 2014. The impact of product portfolio strategy on financial performance: The roles of product development and market entry decisions. *Journal of Product Innovation Management* 31 (3): 516–34. <https://doi.org/10.1111/jpim.12111>
- Kaplan, R., & Norton, D. P. (1996). *The balanced scorecard: translating strategy into action* (Vol. 4). Boston: Harvard Business school press.
- Kester, L., A. Griffin, E. J. Hultink, and K. Lauche (2011). Exploring portfolio decision-making processes. *Journal of Product Innovation Management* 28: 641–61. <https://doi.org/10.1111/j.1540-5885.2011.00832.x>
- Kester, L., E. J. Hultink, and A. Griffin. (2014). An empirical investigation of the antecedents and outcomes of NPD portfolio success. *Journal of Product Innovation Management* 31 (6): 1199–213. <https://doi.org/10.1111/jpim.12183>
- Kester, L., Hultink, E.J. and Lauche, K. (2009) Portfolio Decision-Making Genres: A Case Study. *Journal of Engineering and Technology Management*, 26, 327–41. <https://doi.org/10.1016/j.jengtecman.2009.10.006>
- Khanna, R., I. Guler, and A. Nerkar. (2018). Entangled decisions: Knowledge interdependencies and terminations of patented inventions in the pharmaceutical industry. *Strategic Management Journal* 39 (9): 2439–65. <https://doi.org/10.1002/smj.2923>
- Khurana, A. and Rosenthal, S. (1998) Towards Holistic “Front Ends” In *New Product Development*. *Journal of Product Innovation Management*, Vol. 15, No. 1, pp. 57-74. <https://doi.org/10.1111/1540-5885.1510057>
- Kim, Y. and Wilson, C. (2019) Analysing energy innovation portfolios from a systemic perspective. *Energy Policy* 134 (2019) 110942. <https://doi.org/10.1016/j.enpol.2019.110942>
- Kock, A., and H. G. Gemünden. (2016). Antecedents to decision-making quality and agility in innovation portfolio management. *Journal of Product Innovation Management* 33 (6): 670–86. <https://doi.org/10.1111/jpim.12336>
- Lal, B., Gupta, N. and Weber, C. L. (2012) "Innovation Pipeline Management: Lessons Learned from the Federal Government and Private Sector." <https://www.ida.org/-/media/feature/publications/p/pi/pipeline-management-lessons-learned-from-the-federal-government-and-private-sector/d-5367.ashx>
- LCEDN (2018) mapping the UK research & innovation landscape: energy & development. Low Carbon Energy for Development Network. https://assets.publishing.service.gov.uk/media/5afae9c8ed915d0df1969135/UK_Energy_and_Development_research_landscape_review_Final_April_2018.pdf

- Lissinger, E. and Jönsson, J. (2013) Innovation measurement in a strategy context How to increase innovativeness through measurement. Lund University.
<http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=3807032&fileId=3807036>
- MacMillan, I. C., and R. G. McGrath (2016). Crafting R&D Project Portfolios. *Research-Technology Management*. Vol. 45 (2002) 5: P. 48-59. Taylor and Francis Online. Published online: 27 Jan 2016. <https://doi.org/10.1080/08956308.2002.11671522>
- Markham, S. K., and H. Lee. (2013). Product Development and Management Association's 2012 Comparative Performance Assessment Study. *Journal of Product Innovation Management* 30 (3): 408–29. <https://doi.org/10.1111/jpim.12025>
- McNally, R. C., S. S. Durmuşoğlu, and R. J. Calantone. (2013). New product portfolio management decisions: Antecedents and consequences. *Journal of Product Innovation Management* 30 (2): 245–61. <https://doi.org/10.1111/j.1540-5885.2012.00997.x>
- McNally, R. C., S. S. Durmusoglu, R. J. Calantone, and N. Harmancioglu. (2009). Exploring new product portfolio management decisions: The role of managers' dispositional traits. *Industrial Marketing Management* 38 (1): 127–43. <https://doi.org/10.1016/j.indmarman.2007.09.006>
- Nagji, B. and Tuff, G. (2012) Managing your innovation portfolio. *Harvard business review*, May 2012 issue. <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/strategy/us-managing-your-innovation-portfolio-07102013.pdf>
- Porter, M. (2008) The five competitive forces that shape strategy. *Harvard Business Review*, January 2008 issue. <https://hbr.org/2008/01/the-five-competitive-forces-that-shape-strategy?referral=00269>
- Rhéaume, L. & Gardoni, M. *Int J Interact Des Manuf* (2016) 10: 73.
<https://doi.org/10.1007/s12008-015-0291-2>
- Rothaermel, F. (2012) *Strategic management: concepts and cases*. McGraw-Hill Higher Education, ISBN: 007131
- Schilling, M. (2013) *Strategic management of technological innovation*. McGraw-Hill, 4th edition, ISBN: 978-007-13264
- Schultz, C., S. Salomo, U. De Brentani, and E. J. Kleinschmidt. (2013). How formal control influences decision-making clarity and innovation performance. *Journal of Product Innovation Management* 30 (3): 430–47 <https://doi.org/10.1111/jpim.12009>
- Sitkin, S., L. B. Cardinal, and K. Bijlsma-Frankema. 2010. *Organizational control*. Cambridge, UK: Cambridge University Press.
- Smith, K. (2006). Measuring innovation. In: Fagerberg, J., Mowery, D. C., & Nelson, R. R. (Eds.) *The Oxford handbook of innovation*. OUP Oxford. Chapter 6.
- Spieth, P., and M. Lerch. (2014). Augmenting innovation project portfolio management performance: The mediating effect of management perception and satisfaction. *R&D Management* 44 (5): 498–515. <https://doi.org/10.1111/radm.12092>
- UNDP (2019) *Innovation for Peace and Development: Overview*. UNDP.
http://www.cy.undp.org/content/cyprus/en/home/operations/projects/action_for_cooperation_and_trust/mahallae.html
- UNICEF (2019) *Evaluation of Innovation in UNICEF Work: Synthesis Report*.
https://www.unicef.org/evaldatabase/files/UNICEF_Innovation_evaluation_report_Digital.pdf

Urhahn, C., and P. Spieth. (2014). Governing the portfolio management process for product innovation - A quantitative analysis on the relationship between portfolio management governance, portfolio innovativeness, and firm performance. *IEEE Transactions on Engineering Management* 61 (3): 522–33. <https://doi.org/10.1109/TEM.2014.2327254>

USAID (2015) *Idea to Impact a Guide to Introduction and Scale of Global Health Innovations*. Center for Innovation and Impact (CII), USAID. https://www.usaid.gov/sites/default/files/documents/1864/Idea-to-Impact_Jan-2015-508_0.pdf

USAID (2018) *2018 Impact Brief*. Center for Innovation and Impact (CII), USAID. <https://www.usaid.gov/sites/default/files/documents/1864/impact-brief-2018.pdf>

Vizologi (2018) *What Is Innovation Portfolio?* <https://vizologi.com/what-is-innovation-portfolio/>

Suggested citation

Megersa, K. (2019). *Designing and managing innovation portfolios*. K4D Helpdesk Report. Brighton, UK: Institute of Development Studies.

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