

Organizing for Breakthrough Innovation

Structures for systematically developing and exploiting radical ideas

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Most companies recognize the need for Breakthrough Innovation. Breakthrough Innovations can change the fundamental bases of competition, “re-write the rules” of an industry, and transform the prospects of the successful innovator. In today’s hypercompetitive and fast moving world, Breakthrough Innovations are more important than ever. Examples of Breakthrough Innovations include LED lights, LCD screens, and hydraulic fracturing technologies in the oil and gas industry.

However, systematically delivering a series of Breakthrough Innovations is extremely challenging for a number of reasons:

- By definition, Breakthrough Innovations involve pushing the boundaries of science and technology with all the uncertainty and risk that entails.
- In almost all cases successful Breakthrough Innovation requires know-how that may not already be present in the company, meaning that organizations must grapple with how to identify, assess, access, and develop capabilities outside of their competence base.
- Breakthrough Innovations “change the rules of the game.” Analyzing the market potential of Breakthrough Innovations is therefore extremely difficult. It may be impossible to establish whether there is real market pull for a new solution, since customers struggle to articulate their interest in products which they had not imagined could be possible.

Our recent Breakthrough Innovation survey identified that having the correct organizational model for Breakthrough Innovation is one of the key ways of ensuring success. In this article the authors shed light on the various models available for achieving Breakthrough Innovation, their pros and cons, under what circumstances they are most appropriate and the major considerations to bear in mind when using them.

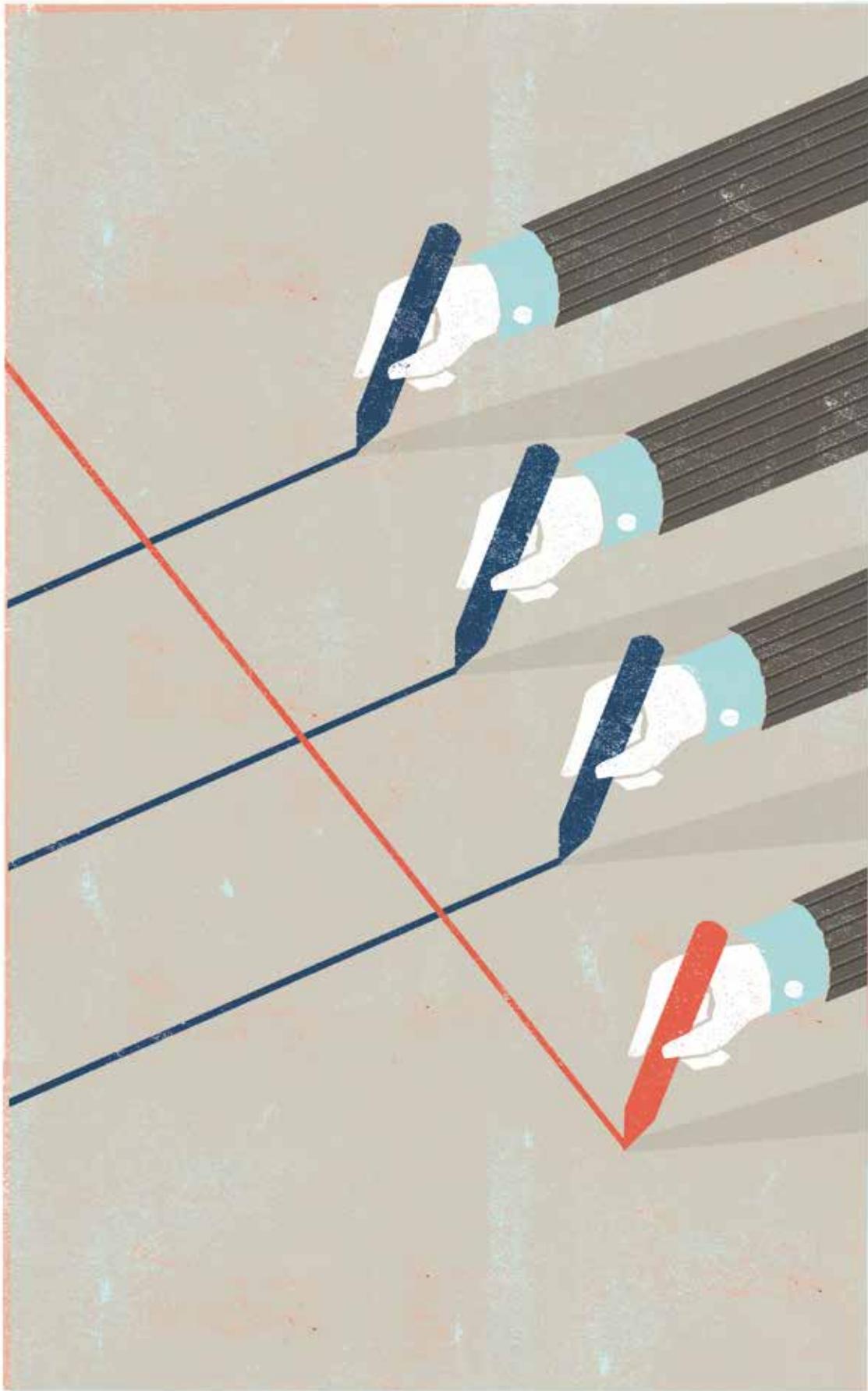


Illustration by Sylvia Neuner

- Breakthrough Innovations usually (although not always) take a long time to come to fruition and as a result are not always compatible with conventional company metrics and valuation methodologies. Further, Breakthrough Innovation often finds itself in conflict for time and resource with nearer term incremental innovation that is often easier to justify in the short term, even if the longer term benefits are smaller.

Arthur D. Little recently conducted a focused Breakthrough Innovation survey¹, involving and questioning more than 80 companies on their approach to Breakthrough Innovation. This showed that despite the fact that companies in our survey expect the revenue contribution of Breakthrough Innovations to be double current levels in 5 years' time, nearly all (88%) companies are unsatisfied with their efforts to date. Our analysis of the results suggests that there are three overall learnings for companies wishing to improve their Breakthrough Innovation performance:

Learning 1: Define the strategic need

1. **Develop an explicit Breakthrough Innovation strategy with clear and quantified goals.** Those companies that define specific Breakthrough objectives and goals are on average nearly four times more satisfied with the results than those that do not.

Learning 2: Organize to meet the need

2. **Ensure single-point accountability and commitment to Breakthrough Innovation from top management.** What sets successful companies apart is not the choice of leadership model but whether they employ a governance approach that ensures long-term accountability and commitment from senior management.

¹The survey sample consists of 83 companies from more than 30 different industries in 14 countries, with an emphasis on European based companies. 70% focus on B2B. Average participant turnover is €15billion.

3. **Choose the right organizational model.** While there is no "one-size-fits-all," having the right organizational model which is suited to the specific domain in which Breakthrough Innovation is being sought was identified as a crucial element of success.
4. **Ensure cross-functionality, ring-fenced funding, and use of intrapreneurs.** The survey revealed that ensuring genuine co-involvement of a wide range of functions, establishing ring-fencing to enable stable investment over the longer time-frame, and employing and encouraging strong intrapreneurs as Breakthrough Innovation leaders were key factors for success.

Learning 3: Nurture high-value practices

5. **Focus on effective trend monitoring and business intelligence.** Successful Breakthrough Innovators make adding to their knowledge a regular habit.
6. **Adopt agile processes and tools with fast iteration cycles.** Successful Breakthrough Innovation teams apply agile processes, drawing on approaches used effectively at startups.
7. **Actively manage the innovation ecosystem.** External networks and partners are very important for successful Breakthrough Innovation. The best performers in this area have developed a clear strategy for innovation ecosystem management and its contribution.
8. **Nurture a creative culture through multiple approaches.** Successful Breakthrough Innovators use multiple tools, approaches, symbols and messages to continuously reinforce a creative culture.
9. **Fail again, fail better: move on and make an effort to leverage the lessons learned.** Infant mortality is fairly high with radical concepts – most do not make it into adulthood. This is normal and should be recognized early on. The key to success is to have a portfolio approach and to ensure that there are other exciting opportunities in the pipeline when things fail.

All three of these learnings are reviewed in our recent Viewpoint “Systematizing Breakthrough Innovation.” In this paper, we will explore the second learning in closer detail. That is, how to best set up one’s organization and governance structure to meet the strategic need for Breakthrough Innovation.

Breakthrough Innovation Organizational Models

A clear outcome of the survey was that having a dedicated Breakthrough Innovation Team is the most commonly adopted and effective approach, yielding 15% higher performance satisfaction over companies with no dedicated organization. It is important, however, to realize that there is no single “one-size-fits-all” model, but rather that the appropriate model will depend on the nature of the organization, the type of the breakthrough targeted, the technology and market domain, the resource available, amongst other factors. The most important considerations are:

- Is the innovation domain well known to the company, or is it far outside its usual business?
- Is the domain highly technology-intensive or complex with high investment needs, or is it relatively low intensity?
- Is the goal to develop something completely inventive (i.e., to do something completely new to the world), or to further develop technologies/products/services which have previously been demonstrated?
- Will it be necessary to bring in expertise and technology from outside, or is it likely that all breakthroughs can be achieved with in-house capability?
- Is there a stringent time constraint (e.g., because a market window is closing), or is a long development time acceptable?

With these key considerations in mind we have identified two key axes for the determination of the correct model:

- The **Complexity of the Technology/Product/Service domain** – whether it is highly technology intensive and will require long term high investment, or whether it is relatively low technology intensity with shorter term lower investment needs.
- The **Novelty of the Technology/Product/Service domain** – whether it is in a domain that is already known to the company, unknown to the company but known to the world, or completely novel (i.e., not known to the world at present).

Within this framework we have identified four generic organizational models which are effective in different circumstances: **Business Unit/Divisional R&D Breakthrough Teams, Corporate R&D Breakthrough Teams, Internal Dedicated Breakthrough Teams, and The Breakthrough Factory.**

These options are graphically summarized on Table 1, while Table 2 summarizes in which circumstances you would favor one option over the other, as well as the key benefits and challenges associated with each. Note, as illustrated in Table 1, that there is considerable overlap in the circumstances in which you would use the various approaches. It should also be emphasized that large companies may well operate more than one of these models simultaneously for different aspects of their business. We’ll now take a look at each of these models in more detail.

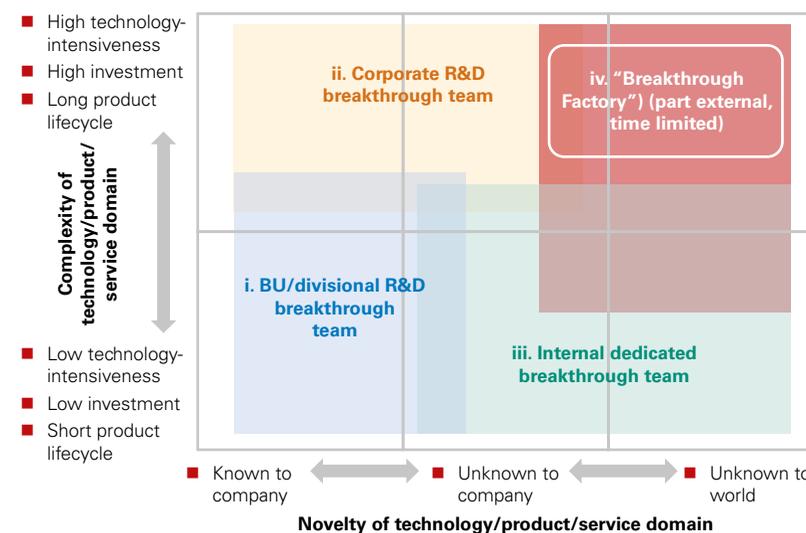


Table 1 Breakthrough Team organizational models

Source: Arthur D. Little analysis

i. Business Unit/Divisional R&D Breakthrough Teams	
Characteristics	<ul style="list-style-type: none"> Breakthrough team embedded in the business units (BUs) or Divisional R&D teams
Appropriate when	<ul style="list-style-type: none"> Innovation domain is close to the core business investments and/or timescales to reach the breakthrough are relatively limited Most required resources and capabilities are available in-house
Benefits	<ul style="list-style-type: none"> Team stays close to core business Avoid "ivory tower" effects
Challenges	<ul style="list-style-type: none"> Ensuring that the Breakthrough team's time and resources are not diverted to short-term "fire-fighting" Organizational and personal responsibilities can be unclear
ii. Corporate R&D Breakthrough Teams	
Characteristics	<ul style="list-style-type: none"> Breakthrough team is situated in a separate corporate unit typically reporting to a CTO or corporate R&D head
Appropriate when	<ul style="list-style-type: none"> Innovation is focused on a familiar domain, but the technology intensity and required investments are high A longer-term perspective and specialist technical skills are required
Benefits	<ul style="list-style-type: none"> The Breakthrough team is insulated from the day-to-day requirements of the business, allowing greater focus
Challenges	<ul style="list-style-type: none"> Can get rapidly disconnected from the core business, lose sight of what the market really needs and become an "ivory tower" of limited relevance to the rest of the business
iii. Internal Dedicated Breakthrough Teams	
Characteristics	<ul style="list-style-type: none"> Multifunctional team formed from different parts of the business (e.g., multiple BUs, corporate R&D, finance/corporate development), reporting directly to senior management
Appropriate when	<ul style="list-style-type: none"> The domain is away from the core areas of business, but the technology stretch is comparatively small There is some requirement for outside technologies and capabilities, but most are largely addressable with internal resource
Benefits	<ul style="list-style-type: none"> Can be flexibly resourced Enables use of best resource from across the company
Challenges	<ul style="list-style-type: none"> Vulnerable to cuts if times get hard Achieving focus and "critical mass" can also be difficult Without clear direction and goals the team can drift and struggle to achieve real progress
iv. The Breakthrough Factory	
Characteristics	<ul style="list-style-type: none"> Autonomous unit within a corporation which typically reports directly to the CEO Only employs limited permanent staff, with the remaining organization formed from temporarily contracted staff, both from within the company and from the outside
Appropriate when	<ul style="list-style-type: none"> The domain is technology intensive and scientific, or technology breakthroughs are needed The domain is relatively far from the company's existing core business
Benefits	<ul style="list-style-type: none"> Agile approach High pace (short time to proven concept) Brand image enhancement Attracts top talents and leading experts Provides a "home" for radical ideas not likely to be pursued otherwise
Challenges	<ul style="list-style-type: none"> Can be seen as a "blue sky" academic research vehicle that is disconnected from the rest of the business Can be difficult to justify using standard business metrics

Table 2 Key characteristics and selection criteria for Breakthrough Team organizational models

Source: Arthur D. Little analysis

i) Business Unit/Divisional R&D Breakthrough Teams

In this model Breakthrough teams are embedded in the business units (BUs) or Divisional R&D teams. These could be entirely separate, or "virtual" teams consisting of groups of people with other business responsibilities. The model is appropriate for situations where the innovation domain is close to the company's core business and where the investments and/or timescales to reach the breakthrough are relatively limited (although since all Breakthrough Innovations are challenging, still significant). The model has the advantage of having the Breakthrough Innovation activities close to the core business, avoiding "ivory tower" effects and allowing the Breakthrough team to fully leverage the capabilities of the core business. Atlas Copco's approach to Breakthrough Innovation is an example of this approach (see Box 1) which in this case supports its strong focus on a limited number of core technological areas.

Since the Breakthrough team is embedded within the core business, the chief challenge with this model is ensuring that the Breakthrough team's time and resources are sufficiently insulated from the routine activities of the business. Frequently companies find that resources are continually diverted from long-term Breakthrough Innovation to short-term day-to-day "fire-fighting," which often has more of an immediate impact on the bottom line of the business. Organizational and personal responsibilities for Breakthrough Innovation can also be unclear, with the result that Breakthrough Innovation "falls between the cracks" with no-one owning the problem.

Accordingly, the key success factors for this model are:

- **Highlight the importance of Breakthrough Innovation to overall strategy.** If people across the division/company clearly understand the importance of Breakthrough Innovation to the long-term strategy and health of the company then they will be much more supportive, leading to fewer conflicts over time and resources, and a more collaborative approach.

- **Clearly ring-fence time and resources, and provide strong senior support.** Make sure that Breakthrough Innovation is appropriately prioritized and recognized, and that time and budget allocations are clearly assigned. Senior members of the division/company should stress the importance of Breakthrough Innovation, and must be prepared to visibly and strongly support more junior staff in their Breakthrough Innovation activities.
- **Assign clear responsibilities to all.** Everyone, even those outside of the Breakthrough team, should understand their role in supporting Breakthrough Innovation. It should be clear to everyone that effective Breakthrough Innovation is a collective effort.
- **Clear targets and reviews.** Clear Breakthrough Innovation targets should be set for both the business and individual personnel using appropriate KPIs. These should be reviewed formally at set intervals to ensure progress against targets and to identify roadblocks and issues.

Box 1: Business Unit/Divisional R&D Breakthrough Innovation approach: Atlas Copco

Atlas Copco, a leading provider of a wide range of industrial products such as compressors, pumps, generators, construction and mining equipment, power tools and assembly systems, exemplifies the decentralized approach to Breakthrough Innovation.

The company is organized into four business areas, each of which has its own area of expertise and dedicated R&D resources. The resources work on innovations ranging all the way from product customization for local customer needs to basic research.

This approach supports Atlas Copco's business model, which is based on having a strong focus on its core technological areas, such as air compression, rock drilling, construction and industrial assembly.

To complement this, Atlas Copco puts a strong emphasis on external collaboration to leverage the competence and innovation capabilities of its partners in other areas, such as information technology or logistics. Atlas Copco therefore continuously tries to build long-term external partnerships with inventors, customers, suppliers, academia, research companies and institutes, and stresses collaboration is a key element of meeting customer demands through their innovation processes.

ii) Corporate R&D Breakthrough Teams

In this model the Breakthrough Innovation team is situated in a separate corporate unit. It is appropriate where the innovation is focused on a familiar domain, but where the technology intensity and required investments are high and where a longer-term perspective and specialist technical skills are required. The chief advantage of the Corporate R&D model is that the Breakthrough team is insulated from the day-to-day requirements of the business, allowing a much greater focus. Evonik's "Creavis" innovation unit is a good example of this approach, see Box 2.

The chief disadvantage of this model is that without close control, a corporate Breakthrough Innovation unit can get rapidly disconnected from the core business, lose sight of what the market really needs (it becomes overly dominated by a "techno-push" approach), and can become an "ivory tower" of limited relevance to the rest of the business. Accordingly, the key success factors for this model are:

- **Ensure regular interaction with the core business.** It is vitally important that the Corporate R&D Breakthrough Team is closely engaged with the core business, so that Breakthrough Innovation remains grounded in the needs of the business and two way communications is maintained. Secondments or regular rotation from the core business into the Breakthrough team should be considered.
- **Drive a market focused approach.** Corporate Breakthrough teams can rapidly become overly focused on a set of "favorite" technologies and lose the link with the needs of the market. Measures that can be taken to address this include setting explicit targets for direct market/customer interaction in focus areas, including market focused personnel in the Breakthrough team, and regular reviews with the core business market team.
- **Retain close review while affording freedom.** It is important that senior divisional/company staff regularly check alignment with the divisional/corporate strategy, and ensure that the

Breakthrough team's activities are supporting the core divisional/corporate goals. Strong action should be taken regarding funding and assignments if activities are drifting into areas which don't support these long term goals. At the same time, considerable freedom should be given to the Breakthrough team with respect to how strategic goals are met.

- **Set explicit targets and an appropriate stagegating process.** While typical projects in this model are long term and high risk, it is still important that clear guidance is set regarding targets, and that formal stagegating processes are used to track progress. However, it is equally important that KPIs and stagegates reflect the characteristics of high risk and long-term Breakthrough Innovation activities, and they should certainly not be the same as those used for incremental or lower risk innovation projects. In particular it is important that they should not be over rigid and, where possible, incorporate "agile" principles to ensure flexibility and encourage speed.

iii) Internal Dedicated Breakthrough Teams

In this model a multifunctional team is formed to exploit those opportunities which are away from the core areas of business but where the degree of technology intensity is comparatively small. Typically the team is formed from different parts of the business (e.g., multiple BUs, corporate R&D, finance/corporate development) and reports directly to senior management. Frequently, personnel will not be exclusively assigned to the Breakthrough Innovation team but will continue to have other business responsibilities. It is an appropriate model when the objective is to diversify significantly away from the current business but where the level of technology intensiveness/difficulty is expected to be manageable – i.e., some invention/novel combination of technologies is required, but not completely inventive science. Since by definition activities in this domain will be outside of companies' core competence areas, external collaboration/partnership is an important part of commercialization activities in these domains. Royal DSM's Business Incubator activities are a good example of this model (see Box 3).

Box 2: Corporate R&D Breakthrough Innovation Teams: Evonik

Evonik is a global specialty chemicals company with over €10billion annual net sales. Its "Creavis" unit is a good example of the Corporate R&D approach to Breakthrough Innovation. Creavis is a strategic R&D unit independent of the core BUs which manages medium and high risk longer term projects.

Creavis is the dedicated unit of the corporate Innovation Management function and is headed by the Chief Technology Officer. Within the Creavis unit "Project Houses" are formed which concentrate the specific know-how of multiple BUs for medium risk innovation projects. Project Houses are setup in co-operation with the BUs, often via fixed-term assignment of BU employees. If successful these result in internal "startups" which may grow into new BUs or be incorporated back into existing BUs (or theoretically spun-out). The corporate function also serves as center of excellence for R&D and innovation management, and drives the R&D reporting and administration.

Evonik uses the Project House concept to enhance cross-BU technology and product competence in relevant fields. The following organizational principles are used for the concept:

- Average budget of €4m per year funded 50/50 by corporate and participating units
- Interdisciplinary team of 20 to 30 scientists from various Business Units and collaboration with external partners
- Time horizon of 3 years including feasibility phase beforehand (1 year) and handover afterwards (6 months)
- Steered by corporate and participating units
- Use and accumulate know-how of participating units
- End results commercialized within units or through internal startups while team members return to participating units with new know-how.

One key aspect to the Creavis concept is the physical separation of the unit, as it is located 40km from headquarters. The building is designed to foster open and spontaneous communication in office, laboratory and technical areas, with central open spaces, project-oriented distribution of the working places, no local separation of the hierarchical and organizational structures, visibility between colleagues via glass walls (including meeting rooms), and social areas on each floor.

Note, Creavis also has "Science-to-Business" projections which tackle high risk, entirely new, innovative fields via collaboration with external knowledge organizations (e.g., universities, research institutes, industrial partners and clients), often via assignment of external employees. These activities fit within model iv) "Breakthrough Factory".

The chief challenge with this model is that, since it is focused away from the core activities of the company, it is vulnerable to cuts if times get hard. Achieving focus and “critical mass” can also be difficult, and without clear direction and goals the team can drift and struggle to achieve real progress. The danger is that disillusionment sets in, and personnel then focus on their “day jobs,” further hindering progress. Accordingly the key success factors for this model are:

- **Form a strong multifunctional team with appropriate resource.** Since in this case the Breakthrough team is focused on areas which are potentially far outside the core business of the company it is important that the Breakthrough team contain a cross-section of capabilities and contain sufficient personnel to minimize risks of isolation.
- **Clearly define individual responsibilities and priorities.** It is important that everyone has clear roles and responsibilities within the team to avoid confusion. Clarifying the organization and reporting lines is particularly important for “virtual” teams where each member has responsibilities outside the Breakthrough team. A single point of responsibility should be assigned for accountability purposes.
- **Set clear realistic targets both for the initiative as a whole and individual personnel.** It is important for individuals to understand exactly how much time and effort they should be devoting to the Breakthrough Innovation initiative, what resources they have available, and how they should balance their commitment to the initiative with any other responsibilities they have. From an overall business perspective it is important to define and communicate clear targets and objectives so that progress can be measured and everyone can see how the initiative fits within the wider story.
- **Senior support.** Senior members of the division/company should stress the importance of Breakthrough Innovation, and must be prepared to visibly and strongly support more junior staff in their Breakthrough Innovation activities.

- **Promote a collaborative, flexible, and open approach.** Since in this model it is virtually certain that expertise and capability will need to be brought in from outside, a flexible and collaborative approach should be encouraged, and the senior management should be open with respect to the commercialization models used, even if these are very different to those commonly used in the organization. The principles of Open Innovation should generally be used.

Box 3: Royal DSM Internal Dedicated Breakthrough Teams

Royal DSM, a Dutch-headquartered global science-based company active in health, nutrition and materials, provides a good example of some of the key aspects of the Internal Dedicated Team approach. Its “Innovation Centers” utilize multidisciplinary teams to drive the development of new business in the new growth platforms identified in the company’s strategy. Key principles of the Innovation Centers are:

- **Long term vision.** Accept that commercial realization will take time, but apply a consistent long-term vision backed by a clear strategy
- **Entrepreneurship.** Nomination and empowerment of “intrapreneurs” to drive concepts through to commercial exploitation
- **Agile principles.** Encourage a “startup” type mentality with fast iteration cycles, frequent customer contacts, rapid changes of direction (within the bounds of well-defined project goals), and “succeed or fail early” philosophy.

Within the Innovation Centers a specific “Business Incubator” forms the cradle for the growth platforms not currently within the scope of DSM’s businesses. Projects from the Incubator that have the potential to grow into a significant business can be turned into growth platforms. Growth platforms are organized into what DSM calls EBAs, Emerging Business Areas. The EBAs are organized as separate units, with the agility and flexibility of a startup, yet can still benefit from all the services and resources of the large parent company. DSM’s ultimate ambition is to turn these platforms into fully-fledged business entities within the course of this decade.

Open innovation is also a very strong part of DSM’s approach and is considered to be a “competitive necessity”. DSM’s open innovation activities include the full range of licensing in, licensing out, joint development, acquisition, incubation and venturing options.

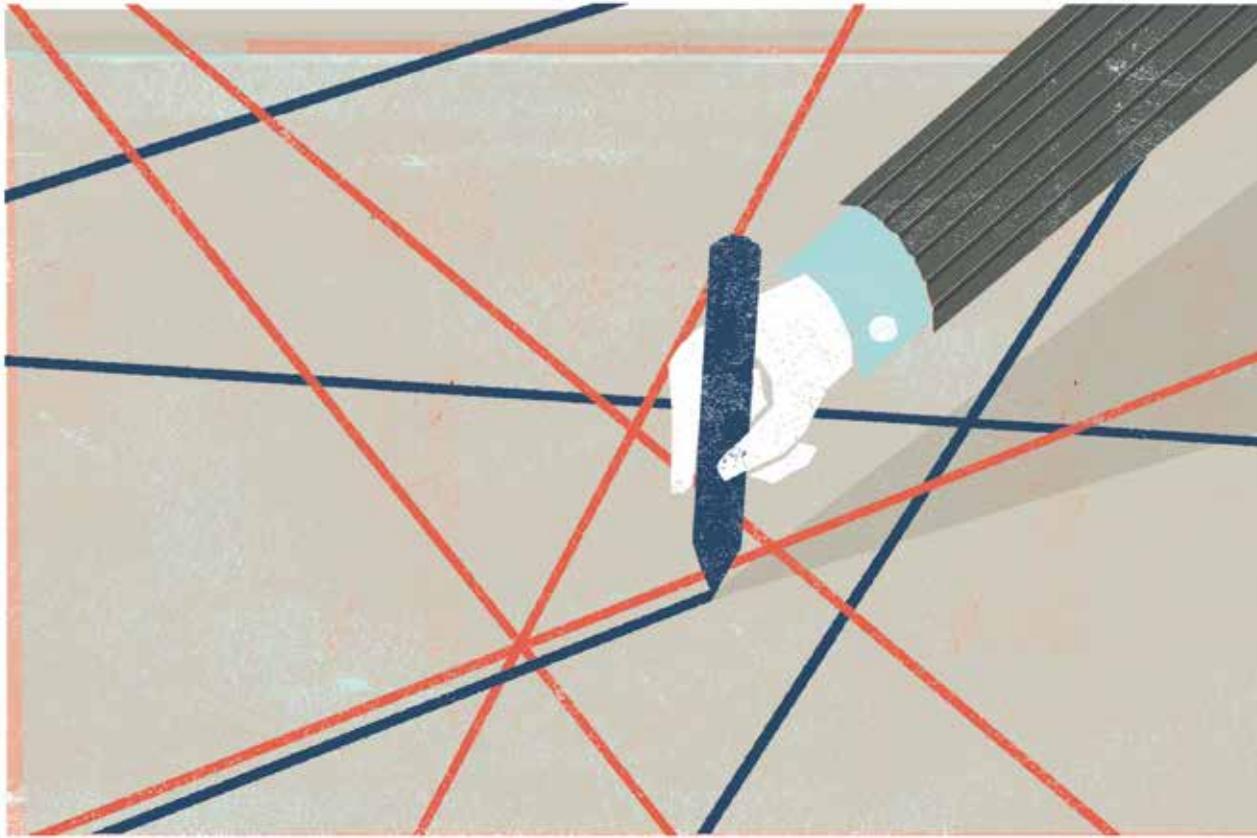


Illustration by Sylvia Neumer

Selecting the right approach

When selecting the right approach for a given innovation effort we believe companies should ask themselves two key questions:

1. **What am I trying to achieve?** Growth in my core business, development of business in adjacent but already existing spaces, or completely new technologies, products, services?
2. **How technologically challenging is it likely to be?** Are fundamental breakthroughs required? Will timescales likely be long and the required investment high? Do I have the appropriate capabilities in-house, or is external capability required?

Armed with the answers to these questions and the guidance presented above, one can determine the most suitable model for the situation. The correct organizational structures and processes should then be put into place to support this approach, noting the key success factors described above.

iv) The Breakthrough Factory

The Breakthrough Factory is an autonomous unit within a corporation which typically reports directly to the CEO. The factory only employs limited permanent employees, with the remaining organization formed from temporarily contracted staff, both from within the company and from the outside. The factory is focused on programs which all have a well-defined objective of either solving a pressing market issue (which is generally known but to which no solution exists), or finding potential applications of emerging science and technology. The Breakthrough Factory concept is reviewed in more detail in an accompanying article in this issue.

Insights for the executive

How to organize for Breakthrough Innovation is one of the most pressing issues facing technology-rich organizations today. Yet many companies struggle to find an effective solution – our survey showed that most companies achieve less than 5% of revenue from Breakthrough Innovations launched in the last three years, but that the most successful increased sales by >40% percent.

Whilst most companies profess to understand the importance of Breakthrough Innovation, many fail to show the necessary commitment – of both time and resources – to maximize their chances of success. All too often companies either just rely on corporate R&D, or else they create a small team of scientists and engineers, give them some limited funding, and wait for a miracle to happen. And when nothing happens straightaway, or when there are short-term priorities or cost-cutting initiatives, the Breakthrough team is often one of the first to suffer.

Whilst there's no magic formula for success, fortunately there are some approaches which have been shown to be effective. A good starting point to ask two key questions:

1. **What am I trying to achieve?** Growth in my core business, development of business in adjacent but already existing spaces, or completely new technologies, products, services?
2. **How technologically challenging is it likely to be?** Are fundamental breakthroughs required? Will timescales likely be long and the required investment high? Do I have the appropriate capabilities in-house, or is external capability required?

Armed with the answers to these questions and the framework presented above, the most suitable organizational model for the situation can be determined. Applying this model together with the other key success factors mentioned above can greatly increase the likelihood of success. Breakthrough Innovation requires creativity – but creativity needs the right management framework to flourish. If you're like the 88% of companies in our recent survey who are unsatisfied with their current Breakthrough Innovation performance, isn't this something that deserves urgent attention?

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