A model for innovation management

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In the management of companies and organizations are ideas that matter and not the models. Models are simplifications of reality that serve to reduce the complexity and transmit knowledge or experience which must then be adapted to another reality.

However, they are useful, not because they offer universal solutions to the specific problems of each company, but to the extent that facilitate the explanation of a complex reality, facilitate the sharing of experiences of other cases, and also implementation processes. Therefore new models arise continuously and many variations. In management models, what counts is what we do with them, rather than the model itself.¹

Innovation process

Innovation is something like bringing new ideas to reality successfully and continuously. It is therefore not the result of genius, chance or luck, it is a process. A process that can designed, implemented and improved in all companies and organizations. A process that favours the creation of an "innovation culture".

It's a measurable process that covers the entire organization with all areas of the company.

It is based on exploration, finding opportunities, opening to the outside, research, risk, trial and error, on individual skills and also the training of highly efficient multifunctional teams.

Obviously, there are innovations that have emerged from a moment of genius, but it is most certain that most, especially those that have proven important in society are the result of research, exploration, risk, and seeking opportunities, i.e. an innovative culture that only occurs in very specific situations.²

First, before embarking on the exciting journey of bringing ideas and concepts to real life, it is important to distinguish between invention and innovation.³ An invention would be something that is unknown so far, usually based on a finding whether scientific or technological. An innovation is the use of this new knowledge or technology to a real application. Something that serves people or to the community.

Innovation can mean a radical jump in business, something that the market has never seen before. Or it can be kind of incremental, i.e. it has taken an existing concept or idea and improves it, typically using a process of stages and developmental phases, leading to a new commercially viable product.

There can be innovation in three main approaches that could also be defined as the results of innovation:

² Peter Drucker. The discipline of innovation

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• Innovate in products or services. Do something new
• Innovating in the way to approach customers, market orientation or positioning. Position yourself in a new way
• Innovation in internal processes. Doing things differently

Innovation is thus a process from idea generation to the reality of the implementation and consolidation of the same in the real world. In business terms, the generation of ideas transformed not only into new products or consolidated market services, but also and very importantly, with significant changes in the knowledge, processes, or market position.

Within this broad process, there is also the way how to consider original ideas and separate "good" from the "not good", and this, the sooner the better.

Innovation is also a process of project management that are turning ideas into concrete projects and a process of program management in the form of continuous flow mode representing a funnel that optimize the needed resources to carry to completion.

It should be an "open" process, i.e., that no barrier can limit or prevent the flow of ideas and participation in projects. Innovating in an open process, is favoured by the interaction of as more knowledge and skills as possible.

Moving from a basic idea or concept to a useful and commercially available product is a very rewarding job, but involves managing this complex process well. High degree of acknowledge and understanding, being able to navigate through it with the resources available, can mean the difference between success and failure.

**Innovation management**

The model presented is based on experience and practice collected from companies. Serves to improve the management of innovation. This is considered a management process, directly linked to the strategy of each company and according to their vision and concrete values. It is an open process and therefore an open innovation model.

The process facilitates management decisions at the right time and allows the company to grow and endure over time. The management of innovation is aligned with the management process and its continuous improvement through the use of measures and indicators. It is a process which is divided into different stages of review.

Experience with this model has served, at the same time, to develop an assessment tool, to evaluate maturity of innovation management and the capacity to innovate in companies and organizations.\(^4\)

It is designed from agile methodologies and customer orientation. Although depicted as a continuous flow, is open to the exterior and based on the iteration and the simultaneous activity of multiple threads.

It is a process that opens the company to the outside, increases their ability to learn and prepared to create continuously: technological advantages, advantages of new customer value proposition or benefits in internal processes to reduce costs.

The process relies on knowledge, information and intangible resources, but it is measurable and covers all areas of the company. It is based on exploration, research, search for opportunities, external openness, risk, trial and error, also based on individual skills and the training of highly efficient multifunctional teams.

The scope of innovation encompasses not only the development of new products, but also the development of new processes, management initiatives and market positioning, and the generation of new concepts and platforms, sometimes based on new paradigms.

It consists of 6 main areas, four of them are the primary activities of the innovation process, the other two are part of the culture and organization of the company, and its vision and strategy regarding innovation.

![Image of agile innovation process](image)

Figure 1. Model of agile innovation process to evaluate Innovation management. (F. Güell, 2013).

Each major area is divided by 2, resulting in the 12 axes that are valued in the assessment tool. Evaluation is basic resource to improve the process and should be performed periodically.

The indicated axes are the following:

1. **Opening to the outside.**
   - 1.1. Customer Orientation
   - 1.2. External exploration

2. **Generate and select ideas. Filters.**
   - 2.1. Generate ideas, concepts, and prototypes
   - 2.2. Filter and select. Phased Reviews

3. **Process Management : Projects and programs**
   - 3.1. Manage projects and innovation programs
   - 3.2. Measures and Indicators

4. **Review, learning and capture the benefits**
   - 4.1. Ability to generate profits
   - 4.2. Ability to review and learn

5. **Culture and organization.** The culture and organization of one company at a given time, is arising from its origin and history. It is important to periodically review the evaluation and subsequent action plans, to follow up the evolution towards an innovative culture.
5.1 Innovative culture. Its importance in innovation is key, and the shift towards a culture of innovation and an organization that fosters innovation, is promoted by the attitudes and practice every day with an adequate model of management. This gradually creates innovative culture, leadership and need the praxis of management team.

5.2 Organization. The organization can help or hinder innovation. Overall a hierarchical or bureaucratic organization hinders both the generation of ideas such as taking risks inherent in innovation, penalize errors and makes the organization slow and favours departamental ‘niches’. Organizations focused on processes, matrix, and customer-oriented are more favourable to innovation, provided it is not too complex decision making, and exists cooperative structure that normally is based on multifunctional teams.

6. Vision and strategy
6.1 Innovative vision. The vision of the company is essential to focus all its processes and activities. Integrate innovation in vision facilitates that the management process is structured around this and the innovation process is part of the decision making.

6.2. Strategy. The management of innovation is integrated into the strategic plan.

The chart above and below show the results of a company evaluated with the assessment tool as mentioned above. The status of the company at the time of evaluation can be observed between the values that are considered minimal level management and the ones that would be at the limit of excellence. From the valuation exercise, are extracted, the necessary actions to improve the process. It is convenient to perform the assessment at regular intervals to see the progress of actions taken and changes. What is valued is the level of excellence and good practice in the management of innovation and the capacity to innovate in companies and organizations.
Practical implementation of the model

By implementing the model in practice companies are taken into account seven key elements for the process, which can be summarised in the following diagrams:

1. **The process of leadership and decision-making.** Form a team or committee of innovation that ensures the innovation process. Its composition depends on the size of the company, may be the same committee or management team or, in larger companies a specific team. But at least it is formed by executives and led by a member of senior management. This is the group that makes all decisions in the process, defines the innovation strategy and has the ultimate responsibility for the selection of projects, project teams and revisions in phases.
2. **Organization by projects / programs.** The result of the generation of ideas and their selection with appropriate filters, is the implementation of innovation projects. Each project is assigned to a multifunctional team with a project leader. In projects or companies of a certain size the project team consists on a core team and other members or specialists who can be incorporated as needed. Programs are groups of projects with objectives, technologies or similar resources that can be managed by common mode, simplifying the monitoring and phased reviews. They rely on 3 main support processes. See diagram:

3. **Structured development of each project / activity.** It's about keeping a structured review of the projects in phases, which maintains a continuous flow and iteration of concurrent development activities. The flow of innovation consists on the set of projects and programs and operates in accordance with the product strategy, information portfolio management and technology management.

4. **Manage appropriate techniques and tools.** In general there are a wide spectrum of tools that may be used, some of them briefly, can be summarized in the following:
   4.1. Design techniques. QFD, DFE, etc. UOD.
   4.2. Design automation tools.
   4.3. Simulation Tools
   4.4. Development Tools and Techniques
   4.5. Tools for planning and control of projects.
   4.6. Techniques and programming tools
   4.7. Financial analysis techniques
   4.9. Tools for information management and documentation

5. **Product Strategy.** It takes into account overall cycle life of products or line segments, the trend in the market, platform strategy, concentration or expansion strategy, and new developments. Competitive strategies considering differentiation, pricing structures, global strategy, cannibalism or technological obsolescence etc. Usually based on the development of a technology roadmap and product roadmap / interrelated services.

6. **Technology management.** The process should allow to have, internally or externally, a bank of technologies such as modular blocks, available to be selected and integrated. A technological strategy for the development of the technological infrastructure, technology transfer and the development of new blocks, is made. The acquisition of knowledge or training of specialized teams may be a necessary activity. The development of technologies requires also reviews in phases as the project development. Recognized the so-called ' technological readiness levels ' or TRL⁵. It is based on a technology development plan, phased plan reviews, experimentation, testing activities, laboratory prototypes etc.

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⁵ TRL. (Technology Readiness Levels). Used by TSB (Technology Strategy Board, UK), ESA (European Space Agency), NASA (USA) etc.
7. **Company Intelligence.** *Intelligent Enterprise and Innovation*. The intelligence in the enterprise is based on continuous internal and external learning and is structured in different processes such as:

7.1. **Economic intelligence.** It relates to the information of economy, geopolitical and legal regulations.

7.2. **Strategic Intelligence:**

7.2.1. **Social intelligence environment,** the firm determines the convergence and consistency of their activities with the social issues and the environment settings. Beyond its image can assess the degree of openness or resistance of society to innovations that are proposed.

7.2.2. **Around market intelligence** can be analysed power relations or influence throughout the supply chain, including suppliers, competitors, customers, end users, new entrants etc. The company can make a map of opportunities, gain time and avoid reinventing the wheel. We can build our “marketing mix” to measure and position us according to the best value proposal.

7.2.3. **Technological intelligence environment,** the company tries to follow the evolution of knowledge and technologies, especially those who can relate to our current or future activity. From one side, it must prevent that innovations and technology, which is the heart of its differentiation, becoming obsolete. On the other hand, should identify the areas where new technologies are developed and deciding whether to acquire or work on new additions to ensure new concepts and innovations for new competitive advantages.

No intelligence can be addressed separately from the others. The market intelligence information feeds that come not only from social intelligence, but also from knowledge that is the result of technological intelligence and come from specialist technicians and products used by competitors.

**Extended innovation chain. Converting science into value**

The extended innovation chain comprises from the creation of new knowledge and technology to the launch or actual application of something new in the market or to a sector of society. Therefore includes non-business actors, such as universities, institutes of technology, research centres etc. both private and public or mixed, who in an open innovation process are equally important to consider.

Note that the same innovation process does not work well everywhere. Not only in all companies, which naturally never are exactly the same, but experience has shown, that the environment and culture, educational level, experience and social organization, industrial structure and efficiency of institutions and administration have great influence on the success or failure of any model of innovation.

The conditions of both culture and internal organization and its environment are key. It is therefore not surprising that the same company, succeed and produce excellent results in an environment or in a country, and be a failure in another.

This also indicates that any model of the innovation process is neither a panacea, nor a standard tool applicable to any organization. Each model and each process must be customized for each organization, specially taking into account:

- Their culture, history, values , etc.
- His vision and leadership.
- Organisation, its staff, skills, motivation, etc.
- The structures, processes and knowledge created, and maturity as an organization

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6 Innovation and learning organisation (1) & (2). http://www.fguell.com/blog/2013/12/13/innovacio-i-empresa-intel%2b7ligent-1/?lang=en
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- The environment in which it is situated
- The culture and values of this environment
- Private and public structures that relate
- The institutions that affect, political, economic, fiscal systems, etc.
- The education system, universities, research centres.
- And also, very importantly, the existence of public, private and mixed institutions, associations, groups (clusters) that act as promoters of innovation being bridges between research and base technology and the company.

This fact probably explains why many international companies (over 80 %) have their centres of innovation in one country, where they believe the conditions are more favourable.

It looks like the term "valley of death", is well known to design where the many new ideas and concepts, which were in the process of innovation and have failed, lie even after 5 or 10 years.

The challenges that an idea or new concept, must confront, among others, are:

- Enter into the correct mental model or right paradigm.
- Finding and working with the right people.
- Identify and secure financial resources
- Forecast and manage cash flow
- Understanding the market
- Finding the right segment
- Create prototypes to secure the idea through closer reality
- Establish the cost and value of the products correctly
- Recognize the opportunities available.

The following diagram shows a simplified model of extended innovation chain, which includes from basic research and developing new technologies to the launch as products or services to the market. It is based on so-called ‘technological readiness levels’ model or TRL:

The ‘valley of death’ tends to be at the point where a conceptual idea needs to be converted into a prototype to prove it works, to assess the costs of production and define the equipment and processes for manufacturing. It usually occurs between levels TRL 4 and 7 (see diagram below). It is at this stage that organizations, public, private or mixed institutions, with bridges between research and technology base and the company can support the assessment of the potential viability, the value of ideas and provide information and advice on the best way to go. They are equally important to help companies making decisions to stop some projects and focus their finances for projects with the best chance of success.  

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7 TRL.: (Technology Readiness Levels. Used in (Technology Strategy Board, UK), ESA (European Space Agency), NASA (USA) etc.
There has been very much described about "Push" and "Pull" models of the innovation process. In practice, innovation is an iterative process of trial and error where openness and communication are critical elements. Sometimes the "push" dominate, sometimes the "pull", but the success of innovation requires an interaction between the two.  

The following diagram shows an approach that combines the technology "push" with the "pull" from the market, to promote those ideas that universities and single companies are not prepared to develop due to the lack of the appropriate connections or high capital costs involved. 

Fund investors like to see turning ideas into prototypes, but since there is still a high-risk, often require a high percentage of ownership in the final product.

A company is in a much stronger position to obtain and realize the value if they have a prototype with international protection of Intellectual Property (IP) and sufficient data for production investment. This is where an independent centre of technological innovation can help. These centres or public, private or mixed institutions also serve to catapult the experience in a wide range of technologies and services, and have appropriate teams to demonstrate the process / product and to show feasibility before investing large amounts of money. This allows to develop, test and scale the prototype, product, laboratory and plant trials before being manufactured on an industrial scale.

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**Innovation networks**

In the 90s, about 88% of the innovation activities of the 500 largest technologically advanced companies, were in their own country of origin, compared with about 55% of its production and sales in much lower percentages. As a result, we find that the forces and technological weaknesses of countries are reflected in their main or biggest companies.

This is why even global companies base the innovation in one or maximum two countries for their expertise and experience in the formulation and implementation of innovation strategies.

There is now a recognition that networks cannot be simply at one end of the spectrum from traditional to do everything in house (vertical integration) and all outsourcing providers (with the attendant costs of management).

We recommend using a “third way”, which is based on systems theory and the fact that the networks have synergistic properties, the whole is greater than the sum of its parts. This does not mean that the benefits flow effortlessly, in contrast, participants in a network must solve problems of coordination and management, and otherwise the risk is that all the benefits are lost. The future of I + D + I is “Collaborate and develop.” Forming collaborative networks that are in contact with a % of the research that can be high and is the one we don’t do ourselves. Example of what Henry Chesbrough (2003) por encima depresentado as "open innovation", where the links and connections become as important as the production and ownership of real knowledge.

The importance of such networking is not just from one company to another, but also about building efficient links within the national innovation system.

Government policies to support innovation are increasing, albeit with more, less or even null success. The aim should be to enable a better connection between the elements, for example, among the many small companies with technology needs to be connected to major research centres, universities, etc.

Simply put, we can see some different types of innovation networks, the positions in terms of (i) radical or incremental way of innovation objective, and (ii) the similarity of the companies involved in the network. View diagram:

Different types of networks have different problems to solve. For example, in Zone 1 have companies with a similar orientation generally working on issues of tactical innovation. Typically, this could be a sectorial forum, concerned in the adoption and configuration of “good practices” in an industrial area. Involve sharing experiences, share information, build trust and transparency and create a shared sense of purpose around innovation.

In Zone 2 activities could involve players in an industry, to explore and create new products, process or concepts, about the latest scientific or technological developments and they need to find interesting connections between adjacent sectors. The purpose is exploratory and challenge existing boundaries. Depending on the degree of knowledge sharing, information sharing and decision risks, often can take the form of joint ventures and formal strategic alliances.

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In areas 3 and 4, the players are very different and can bring very different blocks of knowledge. The risk in giving to know can be high, so is key to management to ensure protection of intellectual property (IP) and establish appropriate rules very clearly. It will also be critical to establish agreements as sharing risks and benefits, and their distribution as this type of innovation is likely to involve considerable risk.

For example, in a UK review of “high value innovation networks”, researchers from AIM\textsuperscript{12}, (Advanced Institute of Management Research) found the following characteristics as more important success factors:

- **High diversity**: Network partners with a wide range of disciplines and backgrounds that encourage the exchange of ideas across different systems.
- **Third parties as process controllers**: scientific partners such as universities, but also consultants and associations, which provide access to the experience and act as gateways to knowledge and 'expertise' across the network.
- **Financial leverage**: access to investors via "Business angels", venture capital firms and "venture capital" which diversifies the risk of innovation and access to market intelligence.
- **Proactive management**: participants regard the network as a valuable asset and actively managed to reap the benefits of innovation.

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\textsuperscript{12} Advanced Institute of Management Research (AIM). http://www.aimresearch.org/