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CHAPTER 3

The challenge of innovation

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In an environment in continuous development, currently experiencing a process of globalisation, technological development, processes of political and economic integration (the European Union) and the development of new world players, economies and organisations need to be increasingly competitive.

In this scenario, characterised by a widely globalised economy, guaranteeing the sustainability of a business project inevitably means investing in innovation which translates into **sustainable increases in productivity and competitiveness**.

Most experts on economy and business management aswell as politicians agree that innovation is needed in our society as a way of maintaining and improving competitiveness, not only of our companies, but of the entire country.

A country which does not educate its citizens in innovation will find it difficult to be competitive. Finland, Germany and Austria have all incorporated specific innovation-based subjects on school and university syllabuses. Even new EU members, such as Poland, have taken steps in the same direction. As this trend is consolidated, these countries will undoubtedly move up the ranking at the expense of others that have not implemented such practices. Innovation is a job not just for government, or even business: it is a task for society as a whole. And if society is the key for adapting to change, it must be informed and trained in innovation.

We are therefore faced with a unique opportunity for successfully tackling the challenge of the new global competitive context and creating sustainable **competitive advantages** based on innovation, knowledge and technology. This will require determination and good decision making by business, and encouragement from the public sector to create the best framework of general and specific conditions for such development.

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3.1. Basic Aspects of Innovation

We first propose to examine the concept of innovation, identifying the factors that influence it and the role of each of the players involved.

What do we understand by innovation?

Innovation should no longer be seen as the purely technical notion that has remained almost unchanged since the Industrial Revolution, whereby the innovative spirit of a company was almost entirely confined to its research and development department. The challenge now is to innovate in order to create value by doing things differently and even by doing radically new things.

However, there is no universal consensus as to what innovation consists of. Generally speaking, though, innovating might be regarding as meaning tuning ideas and inventions into new or improved products, processes or services, with **market acceptance** and **an application in society.**

Some FTF experts argue that we should also include **viable investment**, through a return on investment (ROI) that is acceptable for the company implementing the innovation, and offers a competitive advantage. This is an essentially economic issue, which increases the company's capacity for **wealth creation.**

This definition must be seen in a broad sense, since it covers all activities in the company that presuppose a substantial change in the way it does things, both in terms of the products and services it offers and the forms of production, marketing and organisation.

The purpose of innovation is a systematic search for opportunities to create new products and services or improve processes, in such a way as to contribute value to shareholders, customers and the company itself. It is more than just a series of isolated novel projects; instead, innovation should be a business process, directly linked to the company's strategy and its future competitiveness, with a markedly multidisciplinary nature involving not only aspects linked to the product or process, but also organisational and marketing aspects (Oslo Manual[1]).

Illustration 1 shows the dimensions of innovation.

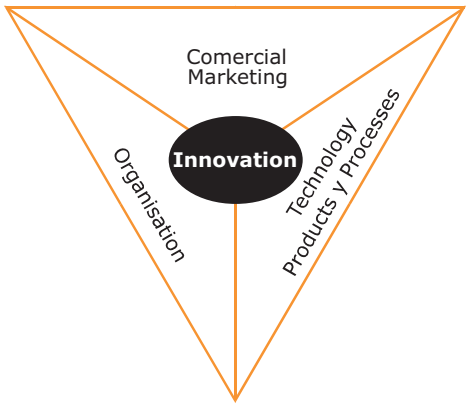
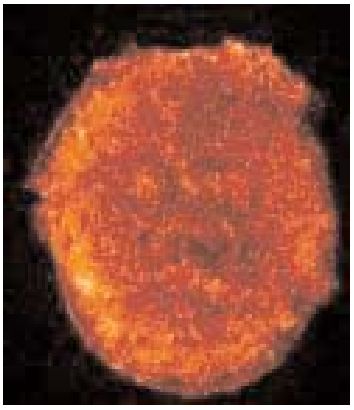


Illustration 1: Dimensions of innovation.
Source: Idom Innova.

1. OECD (2005): "Oslo Manual: Guidelines for Collecting and Interpreting Innovation, 3rd Edition", OECD Publications, Paris.



Innovation should not be confused with invention or a brilliant idea. The latter is the result of creativity and involves the emergence of a new concept; the former requires commercial success. The latter may be accidental; the former is normally the result of a systematic effort. The invention and the brilliant idea become innovation when they are successful on the market. Nor should innovation be mistaken for research. The latter involves the creation of new knowledge; the former involves **creating wealth out of knowledge,** be it new or not.

The results of innovation are generally classed into two levels of intensity: incremental innovation, which involves a significant improvement in something that already exists and radical innovation, which creates a new paradigm. The greater the intensity of an innovation, the greater the risk, but the greater too are the opportunities if it succeeds.

Factors that influence innovation

Among the factors which greatly influence on society's level of innovation, the most important of which involve the individual, i.e. **human capital**, **entrepreneurship** and an **innovative culture**.

The profile of the innovator might be said to be that of a person with great **self-confidence** and **flexibility** to adapt to multiple and complex situations. Innovators are **passionate** about what they are doing and committed to the systematic practice of innovation. They are not enlightened visionaries: innovation involves more than the "Eureka" factor (**creativity** or inspiration), it requires **discipline** and **rigor** to analyse, identify and develop the best alternatives.

Let us know look in greater detail at the factors, in terms of the individual and the environment, that can influence the level of innovation of a country, region or company. For our basic reference point we will take the factors identified by the European Commisión[2], and the contributions of the FTF experts, which can be grouped into eight categories:

Human capital

Over recent years there has been a shift in the global economic paradigm, from an economy based on capital and labour, as the main production factors, to a **knowledge-based economy,** influenced, above all, by the emergence of new information and communication technology (ICT).

The key to this organisational revolution lies not just in technology, but also in the way it is used by the people who make up the organisation or society. The people-the knowledge workers-are the axis around which the technologies must be organised. The success or failure of any particular organisation or of society in general ultimately depends on the possibility of facilitating the development of the potential of the people.

2. See *http://ec.europa.eu/enterprise/enterprise_policy/competitiveness/doc/scoreboard_2004_en.pdf.*

Having qualified staff and assigning them properly is one of the important factors influencing the level of innovation. Knowledge is now the driving force of society and the economy, because of the dramatic changes in many social and economic sectors.

Europe and Spain, in particular, because they cannot compete in terms of production costs with emerging economies, have to generate an important base of **highly qualified** human capital in order to compete with the most prosperous and competitive economies on today's market.

Entrepreneurship

A key challenge of the new economy is to encourage entrepreneurship. This requires a cultural revolution essentially involving a **change in the attitude** to risk, reward and failure.

Innovating requires a willingness of spirit which associates **creativity, entrepreneurship** and **acceptance of risk**.

New business initiatives can promote productivity and increase competitive pressure, forcing others to increase their effectiveness or innovate, and thus improving the competitiveness of the national economy as a whole.

Countries with the highest rate of business initiative, especially in small and medium-sized enterprises, tend to gain the greatest reductions in unemployment and contribute considerably to economic growth.

In order to develop entrepreneurship, others non-cultural factors also need to be addressed, such as: effective financial markets, a flexible labour market, simpler and more transparent fiscal systems and bankruptcy regulations adapted to the reality of the business world.

The European Union is concerned at the difference in entrepreneurship and innovation culture between the United States and Europe. A large number of studies have been conducted in recent years to try to analyse the reasons for this difference in attitude, ranging from personal to governmental aspects. They include the following[3]:

- In the personal area, the US still maintains a pioneering spirit, where society prizes risk and a certain degree of individualism (risk culture).
- Personal mobility in search of a better professional situation is appreciated and promoted within families from a very early age.
- In the government area, a lot more venture capital is available, and this spurs the launch of new innovative companies. Failure of these companies is not "socially punished"; instead it is seen as a valuable learning experience (culture of failure).

3.See *http://www.getec.etsit.upm.es/docencia/ginnovacion/cultura/cultura.htm.*

Innovative culture

Innovation culture depends not only on individual capacities and skills, but also on environmental and structural conditions in the setting. **Interaction by the innovator** is important-with competitors, customers, suppliers, family, friends, etc.-and it is also important that economic and social institutions stimulate innovators through a suitable structure of incentives and recognition.

Respect and **recognition** must come from all of society, so that the innovators feel that what they do really benefits themselves or the community. Encouraging innovation means publicising it within the community and beyond, protecting innovating institutions and individuals, especially small innovators, offering facilities (tax and labour) to the most innovative companies, etc.

An innovative culture often requires the tenacity to fight against established ideas. Dynamism favours innovation over the traditional and conservative culture that dominates Spanish society.

Some of the keys to an innovative culture are:

- Greater creativity: this is a skill which can be developed. School, university and work all furnish people with knowledge; as well as enabling them to master specific fields of knowledge, it can potentially position them at the cutting edge of creation.

- Lifelong learning: always and everywhere.

- Cultural mosaic: Knowledge networks for disseminating this culture to all areas of society.

At this level, in order to try to encourage an innovative culture in society, it is essential to emphasise all stages of **education**. Today's schoolchildren will be tomorrow's researchers, employers or company managers, and it is therefore important to stimulate competition and research from an early age, as well as incorporating innovation as a discipline at all levels of education.

Research

In some cases, the capacity to innovate lies in companies' and countries' research capacity. This is one of the factors many developing countries lack.

Research is one of the important factors influencing innovation, but it is important to remember **that not all research becomes innovation**. Two categories of research can be distinguished:

- Basic: the purpose here is to obtain scientific knowledge which has no specific practical goal or application. Basic research is normally carried out in universities and in itself constitutes a public asset.

- Applied: in this case, the work has a specific practical purpose; for example, market exploitation of new products or improved processes.

It is in this second type of research that innovation occurs, where something is created or improved which can be **introduced onto the market** and which affects the community by satisfying or creating a need.

Given that a large body research comes from the educational area, a fluid relationship should be encouraged among study centres, institutes and universities, in order to foment **transfer of knowledge** from the educational area to business and vice versa.

A suitable strategy of research needs to be established for creating the necessary knowledge that will lead to innovation.

In a later section we will discuss research and development and its impact on innovation in greater depth.

Financing

Access to funds, whether public or private, is essential in implementing an idea. Many of today's innovations are developed in small newly-created companies which do not have easy access to funding. In this regard, policies of support to RDI are a vitally important element in the development of this type of company. Proper regulation and institutional support are also needed to **encourage private venture capital which will help attract** people with experience in managing newly-created companies who can offer not only funding, but also their experience, especially during the first stages.

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From the perspective of new companies, it is also crucial to achieve the funding and support needed to successfully overcome the initial set-up phases. Newly-created innovating companies depend to a large extent on an adequate supply of funds at different phases of their development and they often run into problems satisfying all their financing requirements. They normally have to rely on their equity and on borrowing.

A supply of venture capital to finance innovation is a priority for the EU and its member states, and several initiatives have been set in motion to make up shortfalls, especially in equity funding during the initial phases.

Information and communication technology

Technology is one of the key factors for economic development, because it **naturally spurs innovation**. Information and communication technology (ICT) in particular will continue to have a profound transforming capacity, because its affects all the processes that make up the activity of the people, companies and society at large.

The adoption of ICT in organisations and its extension to business processes has helped create new business models and made it possible to establish new connections between companies, customers, suppliers and trading partners, revolutionising the traditional way of doing business. New technologies, particularly the Internet, have done away with **many limitations of time and space**.

The market is ever more competitive and global, and therefore only an absolute commitment to constant innovation by the organisation can ensure survival. This is a challenge involving not only being capable of generating innovation, but also-and more importantly -being capable of sharing it, improving it and distributing it simply and transparently within the organisation. To achieve this, it is essential to have the technological infrastructure that will allow knowledge to be shared and facilitate group work in an ordered and controlled way, incorporating established work flows and processes.

In the present environment, an increase in productivity requires ever larger inputs of technological capital and a capacity for innovation, particularly in the area of ICT.

Legal and administrative framework

A suitable legal framework is essential for encouraging innovation in the company; excessive red tape, for example, can deter interesting initiatives.

As an example of this red tape, Illustration 2 shows how setting up a company requires more bureaucratic steps in Spain than in other more competitive and innovating countries, ultimately lengthening the time needed to launch the business on the market[4].

4. In Spain there should be greater coordination between local, regional and central authorities to make the bureaucratic requirements for creating new companies clearer and quicker.

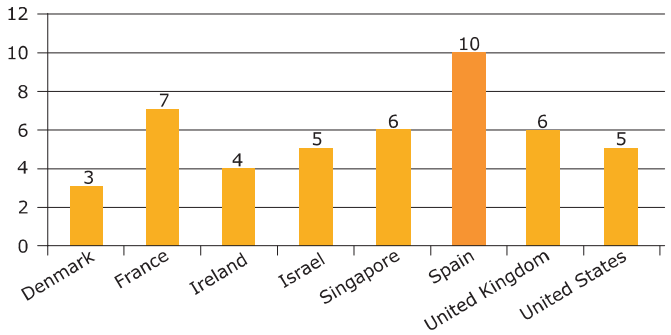

Illustration 2: Number of procedures involved in creating a company.
Source: World Bank Group.

Suitable mechanisms must be established to generate a fluid exchange of information between companies.

In order to encourage the creation of innovative companies, the business sector needs effective financial markets, a flexible labour market, a simpler and more transparent tax system and bankruptcy legislation which is better adapted to the reality of the business world.

Competitive markets

The first few years of the twenty-first century have seen the birth of a new almost frontier-free world, where people, ideas, goods and services, information and discoveries, opportunities and risks are shared and held in common, where they flow around, in many cases instantly and unboundedly.

The result is that the market is ever more competitive and global, and only an absolute commitment to constant innovation by organisations can ensure survival.

This new context of globalised markets offers **greater opportunities** to companies, but at the same time requires new **efforts in innovation, increased competitiveness** and permanent upgrading. The competitors are many and very varied, and can be located anywhere in the world, just like customers and even the workers themselves. And the most innovative discoveries and creations in any area can immediately be made available to all.

Players involved in innovation

Having analysed the factors that might influence the level of innovation, we now list the players who have had an active role in this area.

The FTF experts believe the actors with the greatest role in the area of innovation are governments and public authorities, followed by large companies and consumers. Following these players, in order of importance, come universities, research centres, SMEs and private investors.

The FTF experts believe that **governments** and **public authorities** are amongst the most important agents in innovation; it is they who have to implement the policies required to establish a suitable legal and administrative framework for encouraging innovation.

The most general school of thought among economists and experts in the area is that everything is basically moving towards the creation of an innovative ecosystem with little intervention but a lot of support from public institutions, exercising a positive influence over the other players involved.

In any case, although government economic policies can clearly play an important role in driving innovation, it is up to companies, particularly large ones, to help galvanise the country's economy, by increasing excellence, efficiency and competitiveness.

Large companies are another important agent for innovation: on the one hand, because they have greater financial resources they can make greater investments in R&D, which contributes positively to improving innovation levels in the country; and on the other hand, in the current context of globalised competitive markets and increasingly exigent demand from consumers, innovation has become an authentic necessity for companies which need increasingly novel products and services in a world where competitive advantage is ever more temporary. For example, less than half of the firms in the Fortune 500[5] in the mid-1970s are still in the list.

For all of these reasons, **consumers** are seen as important players in generating innovation, because they shape constantly changing demand and with it exercise great pressure on companies, who strive to satisfy their desires and needs.

Some years ago, American economist Michael Porter identified demanding customers as a key source of competitive advantage[6]. After all, he said, "companies innovate to satisfy demanding customers".

5. See *http://money.cnn.com/magazines/fortune/fortune500_archive/letters/A.html.*

6. Michael E. Porter (1998): *Competitive Advantage of Nations.*

Because of this central role played by the consumer, it is essential for companies to know the characteristics of the demand, in order to adapt differentiated products and services oriented to each segment or customer.

Another target of government policies on encouraging innovation should be **universities** and **research centres**, which are also important agents in promoting innovation. It is there that future scientists and researchers are educated and knowledge is generated.

The fundamental mission of research centres is to generate knowledge through basic research, which serves as a principle for subsequent market-oriented practical research, whose result will be the creation of a new product or service, offered through the companies. It is important that these agents should have independence in management and funding, as this allows for an efficient knowledge network which can include multinationals and SMEs alike, so that the knowledge generated is oriented towards practical market applications.

For all of these reasons, it is crucial that there should be a close relationship between researchers and companies (science-technology-company trilogue), but this is not always the case. On many occasions, there is no communication between business owners who use the innovative technologies and the investigators who perform the research.

University and business have a vocation for innovation. To keep growing, companies need to innovate, and historically the university has been devoted to research.

The next most important player with a role in innovation, according to the FTF experts, are the SMEs. Because they are smaller and less bureaucratised than large companies, they are more flexible and receptive to changes and innovation, and prepared to accept greater risks to maintain their market share or improve their productivity.

Private investors, who the experts consider to be another leading agent, satisfy the needs of companies or individuals who have a novel idea they want to introduce on the market, but do not have access to the necessary funding. The purpose of this type of investment is to be at the forefront of competitive markets. Juridical and market stability must be established in the country that will attract.

Juridical and market stability must be established in the country that will attract such investment. This type of investment tends to steer clear of interventionism and an excessive tax burden on profits, a factor that is important to take into account when framing policies for encouraging innovation.

Ways of measuring innovation

Having looked at the players with the most important role in innovation, we shall now centre on means of measuring innovation.
There is no overall consensus on how best to measure innovation, but we could try to make a microeconomic measurement (in other words at a business level) of the internal effect of an innovation process undertaken by the company. It is important to measure innovation: it is difficult to manage or improve something which cannot be measured. However imperfect the measurement may be, the FTF suggest the following as possible approaches: percentage of company's earnings coming from sources which did not exist five years ago,increase in productivity, income generated from new products, increase in sales volume, improved reputation (greater brand recognition), value creation (for both shareholders and society), marketing times of a product and return on investment (ROI).

In addition to the difficulty of delimiting the economic effects linked to a specific innovative action, the maturity time also needs to be borne in mind: it may not be until the medium or long term (a minimum of two or three years) before it can be judged wither a given innovation process has had a positive result or whether it has been a failure.

Given the difficulty in establishing optimal patterns for the level of innovation and, thus the difficulty in making a diagnosis of innovation in the company, organisations are establishing some templates for internal measurement.

We should not forget that it is just as important to measure the innovative capacity of an organisation as to measure the results obtained from an innovation project. In other words, in order to compare some organisations with others and identify any deviations we need to measure how alert the organisation is and how it anticipates changes in its environment.

At a macroeconomic level, we could measure innovation as being the **capacity for innovation** of a given industry, country or region.

According to the FTF experts, possible tools for measuring this innovation capacity might include: spending on R&D, number of patents, average age of products, processes and technologies, marketing times, percentage of projects with a satisfactory ROI, successful products and services on the market, earnings from intellectual property rights, technical publications and the creation of long-term wealth.

As we have already said, there is no universal consensus on measuring the innovation capacity of a given country or region, but advances have been made in this area, leading to the development, inter alia, by the European Commission, of the European Innovation Scoreboard or EIS[7]). This index, analysed in a later chapter, is based on 26 indicators divided into five categories.

7. Trendchart: *European Innovation Progress Report 2006*, pág. 85 y ss.

See also *http://trendchart.cordis.lu/scoreboards/scoreboard2006/pdf/eis_2006_global_innovation report.pdf.*

In summary, it is necessary to introduce models for measuring innovation, setting targets of convergence with the best cases and setting up a plan for convergence in competitive innovation which will make it possible to go from measuring using resource indicators (spending on R&D as a percentage of GDP), to measuring with indicators of results.

Types of innovation

Having set out the proposals for measuring innovation, we are now going to list different classifications of innovation used on the market.

As we have seen, innovation encompasses far more than just inventing a new product and we need to understand it as a process that affects all areas of business.

According to studies by Doblin[8], innovation initiatives based on an idea for a novel product have a success rate of barely 4%. Many experts in innovation argue that failed attempts indicate a lack of understanding of what innovation actually is and what companies can do to encourage it.

What then is the secret of successful innovation? How can the success rate of innovation initiatives be increased?

Doblin's model of ten types of innovation[9] gives us some keys for answering these questions.

Innovation in the company, rather than the invention of a new product, is the translation of ideas into products, processes and business models which create value for customers and profit for the owners or shareholders. Doblin identifies ten types of innovation in the company, grouped into four categories (see Table 1):

Finance		Process		Offering			Delivery		
Business model	Networking	Enabling process	Core process	Product performance	Product system	Service	Channel	Brand	Customer experience

Table 1: Types of innovation.
Source: Doblin.

8. Doblin:
http://www.doblin.com.

9. Doblin:
http://www.doblin.com/IdeasIndexFlashFS.htm.

Finance:

- Business model: how organisations make profits, i.e., in what point of the whole business process most wealth is generated. This is associated with the added value of the customer's supply and how much the customer is willing to pay for it.

- Networks and alliances: how companies exchange information and encourage alliances within an industry or between complementary industries for mutual benefit.

Processes:

- Enabling processes: how the processes of support to the core activities of the company business and its workers are organised. There are secondary processes in the company which are no less important, such as after-sales care and customer support.

- Core processes: how value can be created and added to the company's supply. The company's competitive strategy lies in its core processes; in other words, it is here that the actions occur that the company knows how to do best. Their organisation and optimisation down to the last detail will allow an improvement in the added value for the customer, the value for which the customer is prepared to pay. It is important to remember that on occasions the company's competitive advantage lies not so much in its core activity itself, but in the relations between two or more activities.

Offerings:

- Product performance: what the core design or features of the company's offerings are. They must be designed to meet the customer's specific requirements.This is the innovation which creates least value and on which many companies concentrate most.

- Product system: how the company links different products. A system which unites various products in an integrated way contributes value, since it helps them to be used in the same system (for example, the Microsoft Office package integrates a series of specific products -Word, Excel, PowerPoint, etc.- within a single system designed to generate productivity in the office).

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- Service: how you provide added value for customers beyond and around the company's products. Customers expect something more than the product itself. For example, when they buy a car, they expect to be able to avail of the after-sales warranty.

Delivery:

- Channel: how they get their offerings to market. One way of innovating is by finding alternatives using existing distribution networks to market other products.

- Brand: how you communicate your offerings, i.e., the marketing strategy. A successful brand may in itself be as profitable an inno-

vation as a new technology when it comes to generating income, since it represents a form of guarantee and its value always remains at source, which is not the case with technologies.

- Customer experience: how your customers feel when they interact with your company and its offerings. This begins long before purchase and lasts long after it.

Doblin says that companies should remove the emphasis from innovations in products and technologies, since they are easier for the competition to copy, and focus instead on business models, customer experience and platforms that will allow companies to create networks and alliances that will benefit all parties.

When a company understands this model and simultaneously successfully combines various types of innovation, the success rate of the innovation initiatives shoots up to between 35% and 70% of all projects. The more types of innovation an organisation works on, in principle the greater will be its chance of success.

The final aim is not only to create value, but also to give the organisation a competitive advantage on the market, which will be difficult for its competitors to imitate.

As we have seen, many attempts have been made on the market to classify innovation. One of the most important was devised by **Joseph Schumpeter**, an Austrian economist and recognised scientist, who in 1934 defined innovation using a classification of five categories:

- Introduction of a new good or a significant improvement in an existing one.

- Introduction of a new production method, which does not necessarily have to be based on a new scientific discovery.

- The opening of a new market, in which the industry in question had not previously penetrated, regardless of whether that market existed before or not.

- The use of new sources of supply of half-manufactured goods, regardless of whether the sources of the resources previously existed or not.

- The creation of new types of organisation, new combinations in the industry, such as the creation or collapse of a monopoly position.

As we can see, this classification includes some of the types of innovation included in Doblin's model (product, processes, etc.). It is a much more general classification, though it is recognised among experts and had a considerable impact on the economy of his time.

Many others have classified innovation in similar terms at one time or another. In the **Oslo Manual**[10], the Organisation for Economic Cooperation and Development (OECD), in collaboration with the European Commission, divides innovation into four types: product innovation, process innovation, marketing innovation (application of a new marketing method that involves significant changes in the design, positioning, promotion or price of a product) and organisational innovation (introduction of a new organisational model, organisation of the workplace or external relations of the company).

Using these classifications, we can see that innovation is an asset found in all areas of the organisation. Over coming years, we will see intensive and transforming application of innovation in operating processes, in improvements in the operating efficiency of organisations, in the way in which they relate with their ecosystem of partners and suppliers, in the products and services they offer and in the way in which they offer them to their customers.

These classifications also allow us, to analyse better innovation and its repercussions, to make a more thorough diagnosis, at both national level and in the business area, of the current situation and types of innovation in which we should concentrate the search for efficiency and competitiveness.

3.2. R&D versus innovation

In general, the trend in Europe is to maintain that investment in R&D is the main "sustainable" driving force of economic growth and the main input for innovation; this doctrine holds that policies that lead to an increase in investment in R&D can generate the greatest growth in productivity and competitiveness. Indeed, this investment is one of the factors most often used to calculate the general rate of innovating effort of a country or even a specific company.

However, just as important as the amount actually invested is whether this investment is backed by **well-studied planning** (where the research should focus, in what industries, at what time, with what resources, when and with what type of financing), so that it is carried out efficiently and doesn't buck the market. It's not a question of just investing for the sake of investing; the purpose should be to centre on areas or industries where some **competitive advantage** can be obtained.

Every year the European Commission publishes European and global innovation scorecards (EIS and GIS respectively). The global scorecard is based on twelve indicators, each divided into five categories[11]: innovation drivers, knowledge creation (which takes into account R&D expenditure by both the public and the private sector), diffusion, applications and intellectual property.

10. See *http://www.oecd.org/dataoecd/35/61/2367580.pdf.*

11. European Commission: *"2006 Global Innovation Scoreboard" (GIS) Report.*

See http://trendchart.cordis.lu/scoreboards/scoreboard2006/pdf/eis_2006_global_innovation_report.pdf.

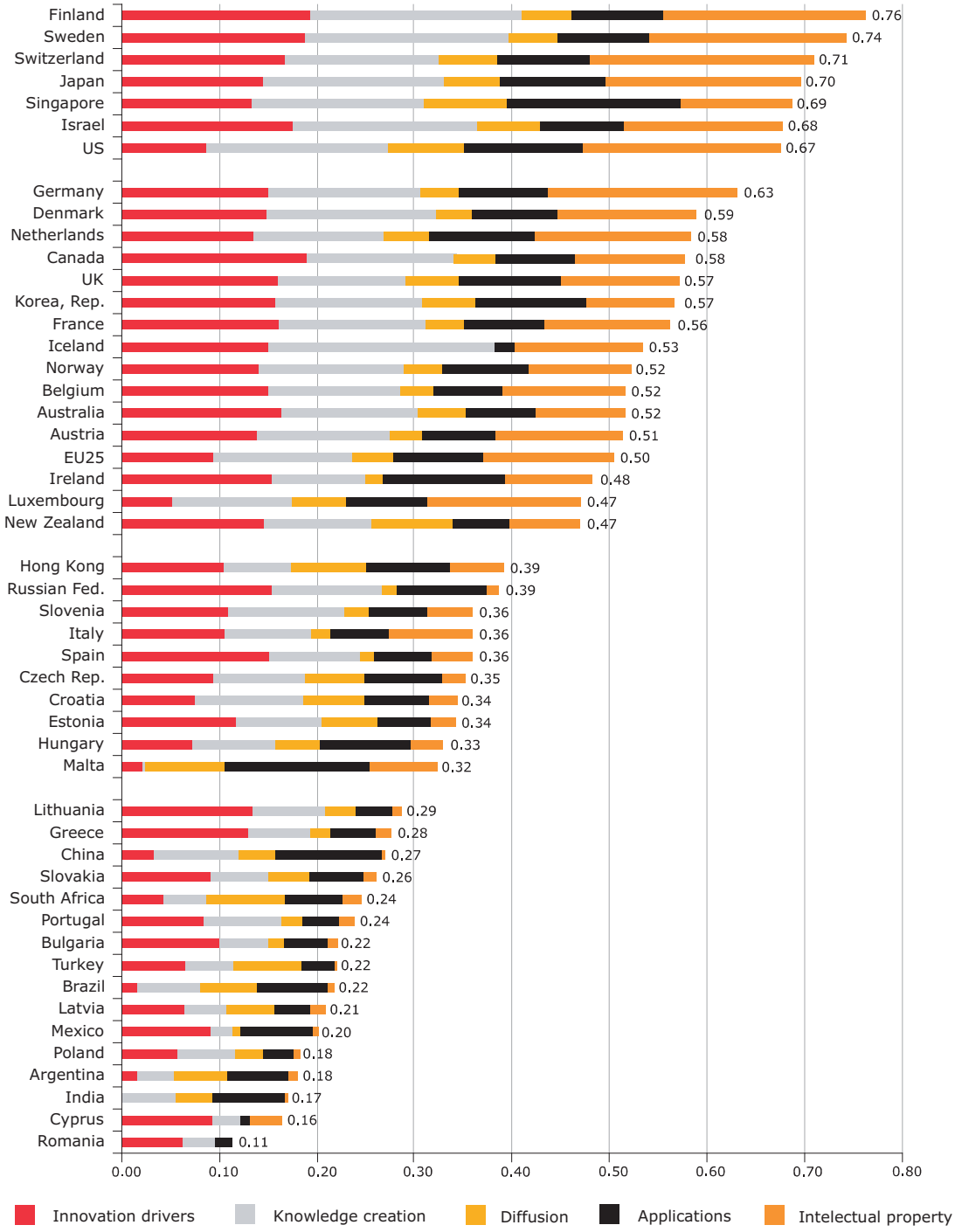


Illustration 3: Innovation scorecard by countries.
Source: European Trend Chart on Innovation, "2006 Global Innovation Scoreboard". (GSI) Report.

Considering the EIS 2006 results for the 48 countries studied, we can see that with a few exceptions in certain regions, there is a positive correlation between the innovation of a country or region and the budget given over to R&D spending as a percentage of GDP, especially in the private sector.

This coincides with the guidelines of the FTF experts, who believe that it is necessary to create incentives for the private sector through fiscal policies that will make it possible to increase investment in R&D, at the expense of the public sector.

This positive correlation between R&D expenditure (especially in the private sector) and innovation can be seen in Illustration 4, in which shows that the world's most innovative countries according to the "2006 Global Innovation Scoreboard" (GIS) Report are also the ones that invest most in R&D as a percentage of GDP (according to OECD data).

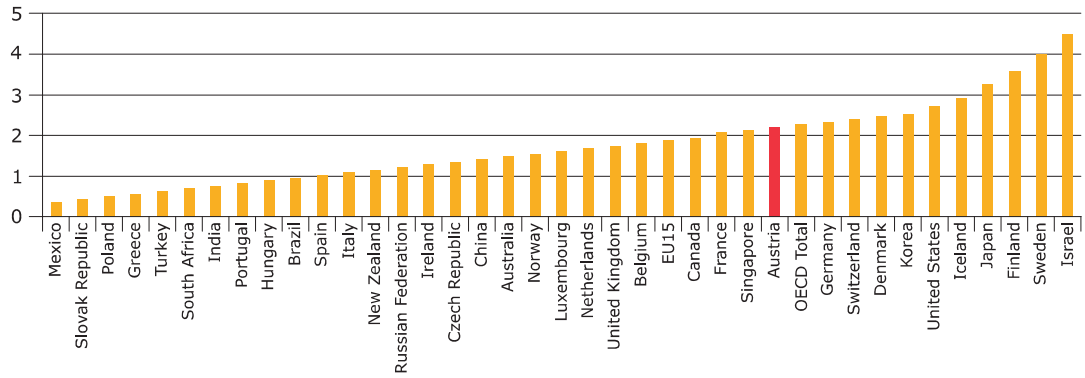


Illustration 4: Investment in R&D as a percentage of GDP by country.
Source: OECD Factbook 2006, Gross domestic expenditure on R&D.

Given the importance of R&D investment on innovation, let us now analyse the situation in Spain.

Spain breaks the rule

Spain trails OECD countries in terms of R&D expenditure, standing well behind the ratios of other countries in the region, such as France, Germany, Switzerland and Denmark. Although there has been an upward trend in investment in Spain in recent decades, with the figure growing faster than the European average, it is still lacking, standing well behind the European average and a long way from other consolidated and emerging regions, such as the US (2.59%) and Korea (2.91%).

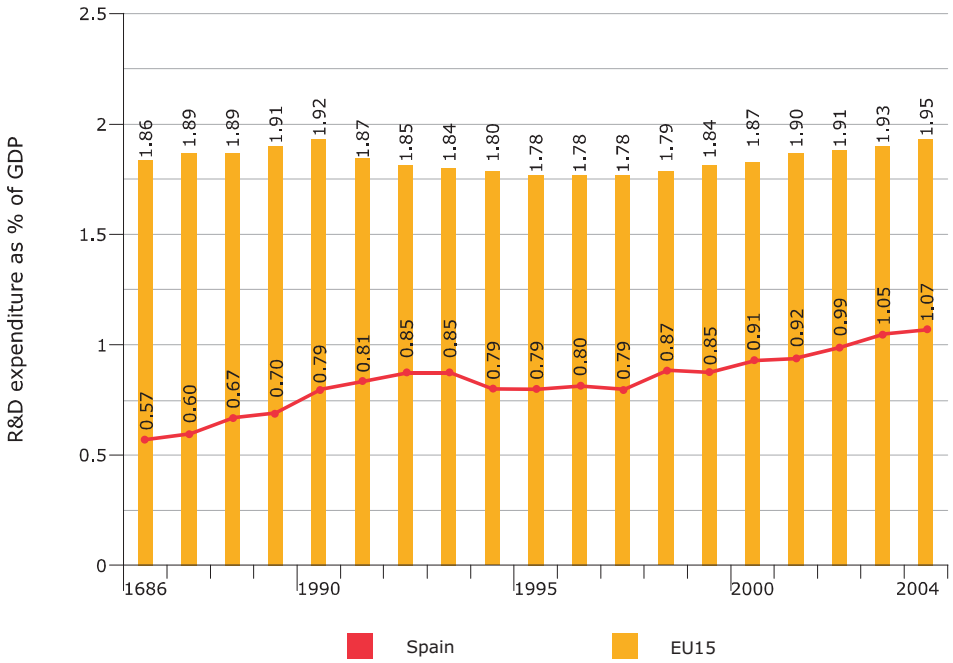


Illustration 5: Investment in R&D as a percentage of GDP in European Union member states.

Source: "20 Años de España en la UE (1986-2006)".
OCDE BD Online. Real Institute Elcano.

In any case, Spain bucks the trend on the positive correlation between R&D expenditure to GDP and a country or region's level of innovation, which can be seen in other more competitive countries: despite an increase in investment in research and development, Spain has been suffering a gradual loss in competitiveness in recent years, falling from 23rd position in the World Economic Forum's competitiveness ranking in 2004 to 28th in 2006.

One possible reason for this apparent paradox is that, although many experts argue that innovation currently constitutes the leading "sustainable" driving force for economic growth and, therefore, for productivity and competitiveness, **we cannot associate innovation only with investment in R&D** without taking into account other factors involved in innovation and, therefore, in competitiveness, such as innovative culture, legal and administrative frameworks, etc.- areas where Spain still needs to take important steps, according to the FTF experts.

Innovation is the essential engine of competitiveness in European countries and investment in R&D can speed up effective investment (which translates into new products, services and processes on the market), but only if that increase in investment finds the right stage.

Even despite Spain's growing investment in R&D, we are still not seeking efficiency. This is demonstrated by the fact that the science-technology-company trilogue doesn't work: there is no communication between the employers-the agents who apply technologies and innovation-and the researchers-in many cases exclusively related to the educational area. There is no market-oriented research.

Given that an significant number of these research projects is publicly funded, there should be effective policies or bodies (greater monitoring) to ensure proper administration of the funds so that they are destined to market-oriented research projects, bring an acceptable ROI and increase productivity and competitiveness; in other words, **research for research's sake is not enough**.

In general, the aims of innovation policies are defined in very ambiguous terms. Most countries do not clearly define their objectives in the strategic area or fail to link the results to a specific system of assessment. A good example of the advances that have been made in this area is the Dutch project "From Policy Budgets to Policy Accountability", where those who develop the policies are required to draw up performance indicators with targets for each section of the budget.

Lessons learnt

In conclusion, the FTF experts consider the following to be some important considerations on the correlation between investment in R&D and innovation.

Investment in R&D is an important factor (though not the only one), for creating new knowledge which can be applied to the market and thus an essential input for innovation.

Some experts also point out that while R&D expenditure may be a necessary condition for innovation, especially in the area of science and technology, it is not sufficient in itself. R&D expenditure is the seed for innovation, although by itself it cannot guarantee successful results for an innovating activity. Factors such as innovating culture, skills for introducing new products or transforming existing ones on the market are also necessary to turn investments in R&D into successful innovations.

In some cases, this might be seen as a model in which innovation is viewed as a process beginning with research, to be developed and finally materialised and distributed on the market. Although on some occasions innovation comes from basic research (R&D), this does not always happen.

What does seem clear is that organisations that systematically invest in R&D have a better knowledge and predisposition for combining existing resources in such a way that they can be turned into market-successful innovations.

Others experts are not as sure of this correlation between R&D expenditure and innovation, since research and development are very product-centred, whereas innovation goes far beyond the product itself, to embrace services, processes, methods of distribution and marketing, etc.

Summing up, it need to be made clear that **R&D on its own cannot generate innovation** nor can it be a measure of innovation at a macroeconomic level, but instead must be backed by a set of factors influencing innovation, which, when combined, form an indicator that may give an idea of the level of innovation of a given country or region.

R&D expenditure by industry

A study by Booz Allen Hamilton on the 1,000 companies that invest most in R&D[12] worldwide, with information for 2005, gives a very interesting breakdown by industry.

Altogether, these 1000 companies have invested $407 billion in 2005, approximately 85% of global corporate investment and 55% of total investment in R&D, including public and not-for-profit investment.

If we break this investment down by industries (Illustration 6) we can see that the computing and electronics, health and auto industries makeup the highest investment in R&D, accounting for 65% of the total.

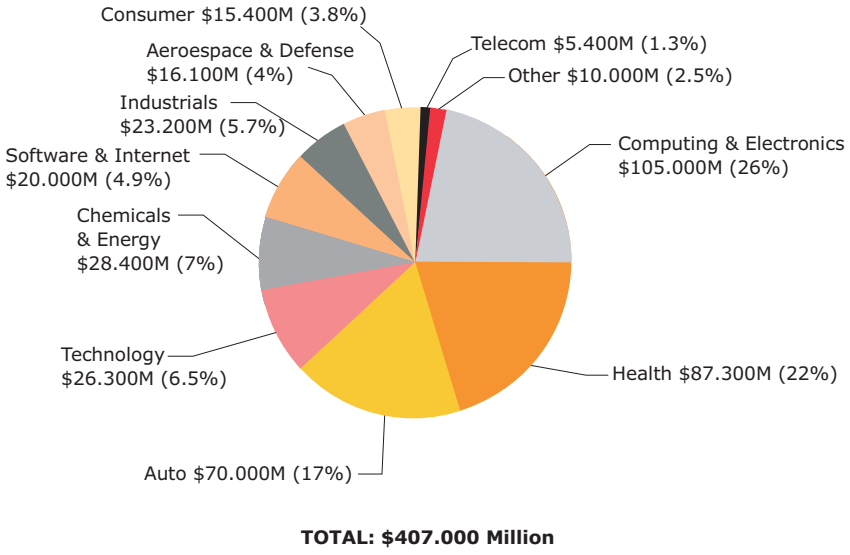


Illustration 6: Global R&D spending by industry.
Source: Global Innovation 1000 2006. Smart Spenders.

12. See *http://www.boozallen.com/media/file/Global_Innovation_1000_2006.pdf.*

As we have already seen, there has been a trend in recent years to increase R&D expenditure. The technology, electronics and pharmaceutical industries have benefited most from this investment. In the auto industry, however (one of the sectors which invests most), investment has not had such a direct impact on income and specifically, on sales.

3.3. Competitiveness through innovation

Competitiveness, productivity and innovation

Competitiveness is determined by a continued and sustainable increase in productivity. In the current environment, increasing productivity requires growing provisions of technological capital and capacity for innovation.

The World Economic Forum defines **competitiveness** as being a set of factors which explain a country or company's capacity efficiently to produce goods and services to international standards of technology and quality and, as a result, to achieve a high rate of productivity and volume of income.

It further defines **productivity** as being the capacity for improving production processes not only in terms of volume, but also in terms of efficiency in the use of the inputs and saving.

The interest in innovation comes from the extraordinary effect it can have on economic activity, provided the innovation is placed on the right stage. Innovation is therefore crucial for the long-term economic growth of a country, since **it stimulates companies' productivity and competitiveness**. Moreover, innovations in one industry can indirectly increase the productivity of others. LCD (liquid crystal display) screens are a clear example of a product developed from research in the defence area, with vast applications in other sectors, such as telecommunications, computing, etc.

Innovation is the basis for an economy's overall growth. It is estimated that it represents 80% of growth in productivity, and that this, in turn, contributes to 80% of growth in GDP.

Some of the positive effects innovation can have on competitiveness-both at national and business level-include:

- Offering of products and services of greater added value (differentiation).
- Optimisation of resources.
- Increase in productivity (reduction in production costs and times).

- Greater volumes of production and services.
- More complex products and services of greater added value.
- Customer loyalty and new market opportunities.
- Satisfaction of demand.
- Empowerment of human capacities and employee satisfaction.
- Increase in social wellbeing.
- Creation of new employment opportunities.

The fact that innovation is now one of the key engines of business competitiveness can be put down to two basic factors. The first is simply globalisation. The opening up of trade and the sharp fall in the cost of communication and transport means that developed countries are increasingly going to have to compete with countries with much lower labour costs and well-trained workforces. The second reason for the importance of innovation to the government and industry lies in the important advances being made in the area of science and technology. These advances are changing our world far faster than any other previous phenomenon and are creating numerous possibilities for enterprising companies to increase competitiveness.

There can be no halting technological change, nor can countries such as Spain compete by implementing strategies based on cost, lower-trained labour or narrow-margin products. Consequently, countries that aspire to continue being competitive must place the emphasis on knowledge and a business spirit and follow a strategy based on differentiation.

The best way to achieve competitiveness has proven to be to encourage individuals, institutions and companies to learn and innovate from which we can infer that competitiveness is strongly rooted in knowledge.

Spain's competitiveness: a gradual decline

For some time, the concepts of innovation, productivity and competitiveness have been appearing together and they are increasingly becoming an important part of government agendas. Spain is no exception, with the government becoming increasingly aware of the gradual loss of competitiveness of its economy on the international stage.

Country/Economy	CGI 2006 Rank	CGI 2006 Score
Switzerland	1	5.81
Finland	2	5.76
Sweden	3	5.74
Denmark	4	5.70
Singapore	5	5.63
United States	6	5.61
Japan	7	5.60
Germany	8	5.58
Netherlands	9	5.56
United Kingdom	10	5.54
Hong Kong SAR	11	5.46
Norway	12	5.42
Taiwan, China	13	5.41
Iceland	14	5.40
Israel	15	5.38
Canada	16	5.37
Austria	17	5.32
France	18	5.31
Australia	19	5.29
Belgium	20	5.27
Ireland	21	5.21
Luxembourg	22	5.16
New Zealand	23	5.15

Country/Economy	CGI 2006 Rank	CGI 2006 Score
Korea, Rep.	24	5.13
Estonia	25	5.12
Malaysia	26	5.11
Chile	27	4.85
Spain	28	4.77
Czech Republic	29	4.74
Tunisia	30	4.71

Table 2: Competitiveness ranking by country (2006).
Source: Global Competitiviness Index Rankings 2006. World Economic Forum.

Since 1995, Spanish competitiveness, measured by trends in export prices, has fallen by more than 10% and the country has slipped to 28th place in the World Economic Forum' ranking.

This decline in Spanish competitiveness - and that of the EU as a whole - can be put down to structural problems, including:

- The difficulty of reorienting an important section of economic activity towards innovating, high -technology industries with better growth prospects.

- Poor results in productivity and the smaller size of ICT (information and communication technology) production industries.

- Low growth in services productivity using ICT because of a slower diffusion of new technologies.

Spanish manufacturing exports centre on products with a low degree of technological sophistication and a limited degree of differentiation, which are sensitive to price competitiveness.

Spanish companies currently face an increasingly integrated world where technological progress is accelerating continuously. The globalisation of the economy means that Europe is now facing fierce competition from countries with lower production costs, such as China and India, and innovation-driven economies, such as the United States.

In order to turn the deterioration in Spain's competitiveness round, it is necessary **to encourage a growth in productivity**, where the country falls far short of other more dynamic economies, such as the US and emerging countries.

Spain has seen the greatest decline in productivity of any EU country in the last fifteen years, according to a report from Conference Board Europe, which explains that an improvement in Spanish productivity requires **investment in innovation** and **worker qualifications**.

"It is not enough to manufacture a better product or offer a better service. It is necessary to differentiate oneself. Product banalization is one of the great ills of the industrial fabric and RDI is one way of avoiding it", argues Camilo Agromayor, general manager of Ofita.

The company is the place where nearly all innovating activity occurs in society. It is particularly relevant in the Spanish case, given the problems of competitiveness faced by the economy and the lack of commercial orientation of Spanish research work. It would be no exaggeration to say that much of Spain's economic future will depend on whether research and innovation in our business world can be multiplied; in other words, it will depend on whether our companies are given incentives to innovate and whether there is a general environment that favours such activities to a greater extent than at present.

Although it is clear that the government's economic policy can play an important role in driving competitiveness forward, it is up to companies to contribute to the revitalization of the Spanish economy by increasing excellence, efficiency and innovation.

3.4. Innovation in different regions of the world

Let us now make a diagnosis of innovation in the different regions of the world, with particular attention on Spain.

In the global context, we have identified two countries (Israel and Singapore) which have achieved convergence with the world's most innovating and competitive countries, by establishing measures and policies that favour innovation.

Another country we will analyse as an example of best practice is Ireland, which for a long time has been successfully applying a strategy of creating a favourable business climate for foreign investment. It is currently reinforcing this strategy to attract researchers and to promote innovation among domestic companies.

3.4.1. Diagnosis of innovation by region

In the different regions of the world there is a significant difference in innovation, marked by the different historical treatment of issues related to government policies, the development of education, the business framework, etc.

If we look at a survey[13] of the main companies investing in R&D, (without losing sight of the fact that R&D is not the same as innovation, although it is one of the factors that influences it), the leading area can clearly be seen to be the Americas, with the US contributing more than 95% in this region; 33% of investment is concentrated in Europe, a third of which corresponds to Germany; and Asia comes in third place, with Japan at the head. In other words, more than 71% of global R&D expenditure is concentrated in just three countries.

According to this information, Europe has a more even distribution among component countries than the Americas and Asia.

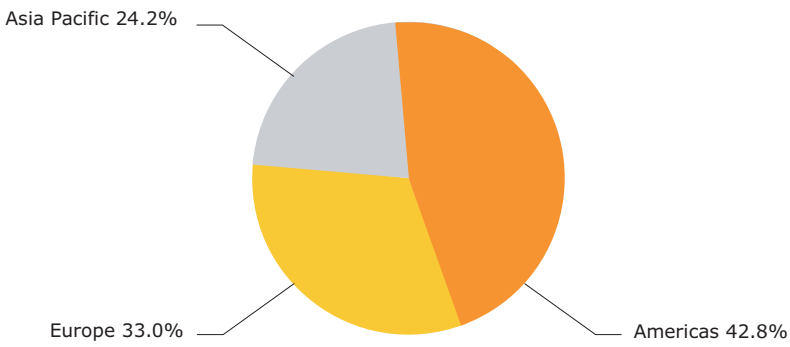


Illustration 7: Distribution of R&D expenditure by regions.
Source: "2006 The top 800 UK & 1250 Global companies by R&D investment".

We shall now analyse the situation of Europe, the US and Asia.

Europe: a long way to go

Innovation is becoming a priority in all European countries, but the specific targets continue to be ambiguous.

A study by the European Commission, *the European Innovation Progress Report 2006*[14] (referred to in the previous section), gives an innovation ranking for the 25 countries that formed the European Union in 2005, together with Switzerland, Japan, the United States, Iceland, Norway, Bulgaria, Rumania and Turkey. The results can be seen in Illustration 8.

13. See *http://www.innovation.gov.uk/rd_scoreboard/downloads/2006_rd_scoreboard_analysis.pdf.*

14. See *http://trendchart.cordis.lu/Reports/Documents/EIPR2006-final.pdf.*

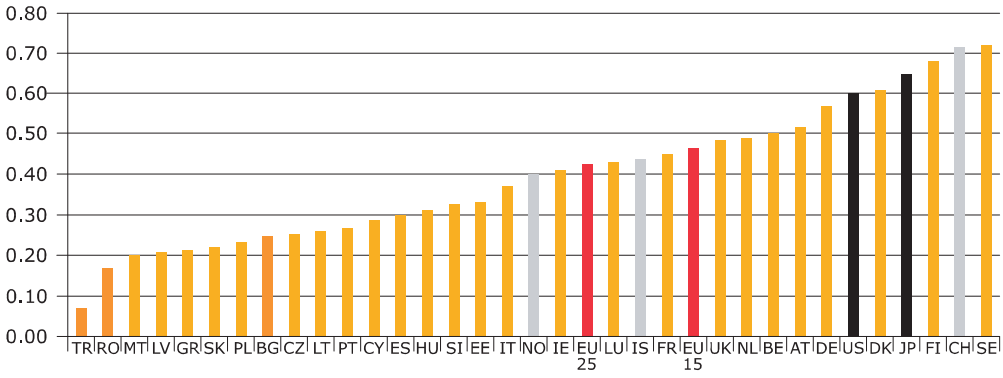


Illustration 8: Innovation scorecard by countries.
Source: European Innovation Progress Report 2006. Trendchart.

The index includes 26 indicators grouped into five categories[15]: Innovation drivers, Knowledge Creation, Innovation and Entrepreneurship, Application of Knowledge and Intellectual Property (see appendix).

According to this scorecard, Sweden, Finland, Denmark and Germany are the European leaders in innovation. At the other end of the table, Spain stands 16th in the EU-25, among the countries that are losing ground, alongside Poland, Estonia, Bulgaria, Slovakia, Rumania and Turkey.

The US and Japan continue to be far ahead of EU-25 in matters of innovation, due mainly to European shortfalls in areas such as patents, population with higher education and investment in ICT. In addition, there is less commitment by companies to R&D expenditure and less participation in international innovation and development networks.

15. Innovation inputs:
Innovation drivers (five indicators): measure the structural conditions required for innovation potential.

Knowledge Creation (five indicators): measure investments in R&D activities, considered as key elements for a successful knowledge-based economy.

Innovation and entrepreneurship (six indicators): measure efforts in innovation at a business level.

Innovation outputs:
Application (five indicators): measure the performance, expressed in terms of labour and business activities, and their value added in innovative sectors.

Intellectual property (five indicators): measure the achieved results in terms of know-how.

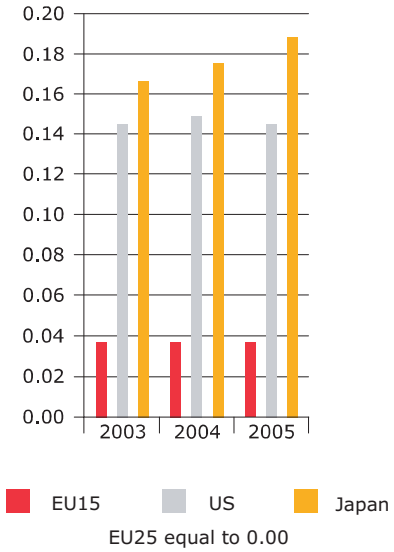


Illustration 9: Innovation gap between the European Union, the United States and Japan.
Source: European Innovation Progress Report 2006. Trendchart.

The European approach to innovation is currently changing from a traditional method to a more systematic vision. Traditionally, the yardstick used to measure a country's innovation was R&D expenditure as a percentage of GDP and, generally there has been little monitoring of the results of policies and projects undertaken. Currently, more complex methods are beginning to be used to reflect the real situation in this area and the final impact on the economy in countries such as the Netherlands, Portugal or Latvia. The Netherlands has set up a system for reviewing policies, the VBTB project (*From Policy Budgets to Policy Accountability*), to determine the relationship between policy targets, activities and resource allocation.

United States: innovating culture and policies to encourage innovation

In the United States, sustained scientific development and innovation are the keys to maintaining competitiveness and are encouraged through a **stable system of investment and policies** (such as federal investment in leading-edge research and scientific tools), an efficient system of secondary education, major institutions of scientific higher education, lifelong learning schemes for workers, focused immigration policies to attract the world's best scientists, private investment in R&D to turn discoveries into applicable technologies, processes and techniques, protection of intellectual property and a business environment which stimulates entrepreneurship through a flexible labour system, capital and markets that are capable of rapidly transmitting new technologies.

Another of the factors that favours innovation in the United States is the survival of a **pioneering spirit** where risk and a certain individualism are prized and praised by society. Indeed, FTF experts believe that the factor with the most influence on the US's innovation rate is its innovating culture, closely followed by its entrepreneurship and human capital (education, talent, etc.).

The individual attitude, institution-to education and the need to have the knowledge and mechanisms for properly managing and improving information is an essential part of the American way of life, and Americans take an active part in keeping abreast of new developments.

Using nearly all relevant metrics, the US is the world leader on the science and technology market. With just 5% of the world population, it employs nearly a third of the world's scientists and engineers and invests more than $300 billion in R&D, nearly as much as all other G-8 countries put together[16].

Asia: a firm commitment to innovation

Over the last decade, Asia has been positioning itself as a major centre of innovation, favoured both by a change in innovation management in large international companies (which have made a commitment to the management of global innovation networks, due essentially to the globalisation of technological markets) and by an increase in the qualification of the labour force in these countries.

Large companies, mainly in the United States, are increasing R&D expenditure in these countries and are trying to integrate all innovation clusters in global production, engineering, development and research networks. Traditional global production networks are being turned into **global innovation networks**.

As the financial crisis of 1997 showed, the focus of these economies makes them vulnerable, with a high level of dependency on exports of electronic items (see the crisis in the electronics industry in 2000), highly integrated into global production networks and, in short, with earnings that depend to a great extent on exports to the United States. For all of these reasons, these countries have decided to commit to technological diversification, centring on applied research and on developing products whose components and technology are not necessarily novel in the world or difficult to acquire.

The efforts made by Asian countries to try to achieve more stable economies have borne fruit. The governments, together with the leading local electronics and software companies have made major investments in improving infrastructures (especially broadband communication) and cutting-edge R&D programmes.

16. See *http://www.whitehouse.gov/stateoftheunion/2006/aci/aci06-booklet.pdf.*

Countries such as South Korea, Singapore, Hong Kong and Taiwan, together with the small European Nordic countries, are world leaders in broadband access and speed rates. Some regions of China and India are also rapidly approaching similar levels.

In addition, investment in R&D as a percentage of GDP of the five Asian leaders in electronics exports has increased considerably, with China and Singapore as the main investors.

This has all led to an increase in research in the area, an increase and in the number of patents and the creation of powerful innovation clusters.

Asia's role in innovation on a global scale is set to increase[17] and it will play an increasingly active role as a promoter of new innovation resources. The greatest appeal of this region, and the reason why it is playing a more central part in this innovation "shift", is the **great improvement in its talent base**. Other factors include the development of very specific skills, such as quality control, resource management, production chains and customer relations.

All of these transformations have brought about essential changes in management and the mobility of innovation on the international scene.

3.4.2. Diagnosis of innovation in Spain

As we have seen, innovation is therefore crucial for the long-term economic growth of a country, since it stimulates companies' productivity and competitiveness.

Consequently, innovation should be particularly relevant in countries such as Spain, which despite being classed as the world's "eighth power" by several indicators, nonetheless ranks twenty-eight in terms of productivity.

There is a large gap in innovation between Spain and most of the leading European countries. As we have seen, Spain ranks close to the bottom of the EU-25 innovation scorecard, in sixteenth place.

Illustration 10 assesses each of the factors analysed in this innovation scorecard[18], to try to give a detailed diagnosis of Spain's real position in the area of innovation.

17. See *http://www.eastwestcenter.org/stored/pdfs/SR010.pdf.*

18. European Innovation Progress Report 2006. Trendchart (p. 93 and ss.). See *http://trendchart.cordis.lu/Reports/Documents/EIPR2006-final.pdf.*

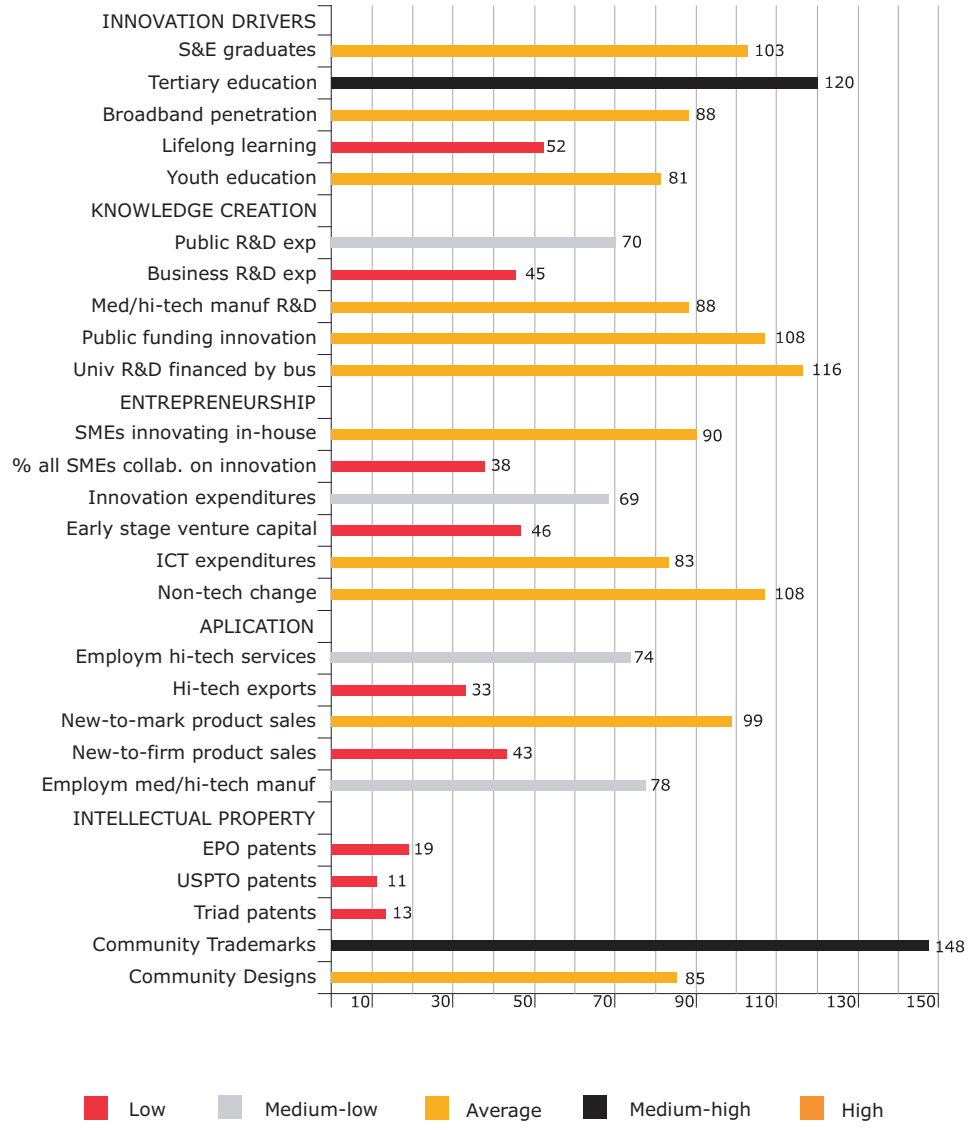


Illustration 10: Breakdown of innovation scorecard: Spain (relative to EU-25 average).
Source: European Innovation Progress Report 2006. Trendchart.

One of the areas where Spain continues to lag behind its EU neighbours is in **R&D expenditure**. As we have seen, Spain is one of the stragglers in terms of R&D expenditure, coming well below the European average as a result of low investment in R&D in the business sector, a lack of commitment to innovation among SMEs and a lack of venture capital.

Some of the measures adopted in Spain to turn this trend around include:

- Tax deductions for investment in R&D.
- Financing facilities for technological and innovating companies through the Official Credit Institute (ICO).
- Financial support from the Centre for Industrial Technological Development (CDTI) through interest-free loans, for the promotion of technological developments and innovation by Spanish companies.

However, these policies are not enough to achieve a significant increase in Spain's investment in R&D and innovation.

Another factor that influences innovation and in which Spain has a lot of room for improvement is **lifelong learning**, where it invests only 52% of the European average, placing it close to the bottom of the ranking (23rd out of the 30 countries analysed). It is in this factor that Spain holds the worst position, as opposed to other human capital factors such as volume of university students, including scientists and engineers, where it scores well.

Aware of the importance of this factor, the government has developed programmes (for example, FORINTEL, a telecommunications training scheme) to encourage lifelong learning, especially in areas related to the information society, to help Spain catch up with neighbouring countries.

Other factors on which Spain should focus in order to improve its level of innovation include the preparation of products and services with a **high technological component** and **technological exports.** The *Government Reform Plan* covers industries such as telecommunications and IT, renewable energy and energy efficiency, environmental management and infrastructures. The plan, which has a budget of €100m, will be applied during the period 2005-2007.

It is also planned to bring in funds of funds-i.e. funds which will be invested in private venture capital funds, in turn targeting investment in technology companies in the first phases of development. This measure supports existing programmes for the creation, through public initiative, of 110 new companies in 2008 and 130 in 2010.

The most important challenges Spain faces include a lack of coordination between the different actions promoted by different authorities, a lack of collaboration between academia and business, and excessive red tape in public grant processes for technology projects.

In the conclusions of the report, the FTF experts examine Spain's weaknesses in the area of innovation and propose ways of remedying the situation.

3.4.3. Best practices

Israel: making a virtue of necessity

Israel, a country with a population of little over six million inhabitants which has suffered many years of Intifada, has a growth rate of 5%. It has focused on giving support to research and development, investing 4.5% of GDP in civil R&D. More than a third of its industry is made up of high tech sectors, which are at the forefront of growth in the national economy, and it has the highest concentration of high tech companies outside Silicon Valley. It also has the second-greatest number of companies trading on Wall Street of any country in the world and in 2005 its venture capital companies captured funds to a value of over $1.5 billion, reflecting its global leadership in the production and exploitation of patents and company creation.

Its main resource is its people, who have a **high level of education** (Israel has the second highest rate of investment in education in the world) and a strong **motivation** to better themselves, innovate and undertake new venture business activities of risk. The dramatic conflict it is facing means that Israel is a highly-mobilised society which uniquely **values risk-taking** and contributions to the creation of wealth and welfare, accepting failure as an experience which needs to be taken into account in future business projects. The country's mentality is built around the need for new technologies and on positioning itself at the forefront in order to grow, since it sees this as being the only way it can remain competitive in a world of strong competition where remaining at the top in the medium to long term cannot be guaranteed.

"Making a virtue out of necessity" or turning weaknesses into strengths is the paradigm of Israel's performance: its huge military spending is also the source of a burgeoning electronics, aerospace, security and biotechnology industry which sells its products and its know-how in civil applications throughout the world. Its desert territory and the need for water and fertile land have led to the development of agricultural and environmental technology and industry, exporting to a host of other countries. Although Hebrew is the official language, a large percentage of the population speaks fluent English, which is an enormous boon to co-operation and the necessary understanding with the rest of the world.

Moreover, Israel is a cosmopolitan country, which combines very different experiences, business and social cultures and ways of viewing life and this gives the country an important stock of social capital and relations throughout the world, facilitating the exchange of experiences. This factor is of key importance in an ever more globalised world, particularly for launching new knowledge-intensive companies. This requires exchanging and comparing similar or collateral experiences, knowing the opinion of most advanced technologues and having correct and of quality information.

Israel's **scientific and technological system** is particularly important, characterised as it is by two crucial elements which are very easy to understand: a commitment to excellence and the exploitation of the results of research. It is committed to commercial exploitation of its intellectual property and making it one of its main sources of funding.

Companies receive support from an innovative system of business incubators, closely related to the knowledge generation centres and especially targeted at innovating technological companies. The incubators are institutions with a very professional public-private management which in many cases take a share in the equity of the new company, providing key support in funding during the first two or three years and offering advanced management services and, very especially, services in the area of international marketing, networking and projection and global business mentality. In this context, important undertakings have been made by the electronics industry and all its derivative industries and the life sciences area, where the country is forging a clear global leadership for itself.

In conclusion, Israel has an advanced system of science-technology-innovation which, combined with the high qualifications of its personnel, have led it to position itself, despite its small size and lack of natural resources, among the most competitive and innovative countries in the world.

Singapore: efficiency in the education system

Singapore is now one of the most prosperous countries in the world, with strong commercial ties in the international arena, which in recent years has managed to the top of the competitiveness rankings, overtaking the United States and Japan[19].

During the forty years since its independence, Singapore has enjoyed immense political stability. This domestic stability has enabled the government to focus on international relations, establishing a large number of commercial and political agreements with different countries and international institutions. This presence has allowed Singapore to play an important role in international politics despite its small in size and relative economic power.

Singapore has undergone a transition from an economy based on efficiency in manufacture (cost reduction in industrial production) to one based on innovation and creativity. The interesting thing about the Singapore case is that this apparently successful process has been government-directed and is the result of entirely centralised strategic planning. This is a government strategy which focuses on creating an attractive urban centre for innovators, which will generate an offering of innovation ahead of the trend in other developed countries, giving this city-state a competitive edge in the global economy.

19.See *http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/gcr_2006/gcr2006_rankings.pdf.*

The government is committed to improving Singapore's appeal as a destination for **direct foreign investment**[20]. To this end, in addition to general tax cuts, tax incentives are offered in industries considered to have a high growth potential, especially those that incorporate high added value.

Singapore has a highly industrialised economy and its leading sector is industry (especially electronic products, biomedicine and chemicals), which accounts for 36% of total foreign investment. The second most important sector is banking and financial services, followed by commerce, transport, storage and communications.

Singapore's economy depends to a great extent on international trade, since it is one of the world's most important distribution points, making it especially vulnerable during periods of recession in international trade. It is one of the world's most open economies, with an openness index (measured as exports + imports/GDP) of 321% in 2004.

Singapore's economy is characterised by high quality infrastructures, efficient and flexible markets, a workforce well educated from childhood and high levels of technological preparation and capacity for innovation.

Because it is the most stable political and economic centre in South East Asia, Singapore has been the beneficiary of large investments from multinationals, who have set up their distribution, production and management centres for the region in this small country. In addition to these optimum conditions, tax incentives also help attract foreign companies to the country.

Despite the lack of natural resources, Singapore has achieved an average growth rate of 7.8% over the last 43 years (Singapore Department of Statistics, 2004). This economic progress can be attributed to a number of factors, including: strategic location for transport, financial and commercial distribution centre, major increase in direct foreign investment, well educated manufacturing labour force, a government which encourages private business and excellent infrastructures.

Over recent years, Singapore has specialised in producing for third parties. It has become the main distribution centre for global production in industries such as electronics, engineering, chemicals and pharmaceuticals. The government has been successful in anticipating needs and is reorienting measures towards the manufacture of high quality products and towards knowledge-intensive activities. Singapore has had to create sustainable competitive advantages through innovation. At the end of the 1980s, it began to make major investments in R&D. In the early 1990s, public research institutes were created to support growth and development in specific technological sectors.

20. "Direct foreign investment" is defined as being investment in which the management control of an organisation resident in one economy is held by a company residing in another economy. Direct foreign investment involves a long term relationship which reflects the lasting interest of the investor in a foreign organisation.

One example was the government-created **Local Industry Upgrading Programme** (LIUP), whose aim was to build a network of knowledge-based companies. This programme encourages long term agreements between foreign companies and local suppliers to help them modernise their products and processes. The LIUP offers financial and administrative support for upgrading and developing personnel with a commercial profile who work closely with foreign companies. It is hoped that all of these initiatives will help local suppliers expand internationally, setting up plants abroad. In this way, the government of Singapore can keep control over the nature and contents of the city's modernisation process.

As a result of this programme, some local companies have gone from being local suppliers to become international companies performing highly complex functions. This shows that the Singapore approach of combining a strategy of promoting local companies with the programme of inter-company ties has had a positive effect on the domestic business sector.

Another of Singapore's essential features, a well-educated population, is a result of the government's implementing **educational policies** that seek to support universities and research centres and facilitate the connection with industry, generating a broad knowledge network, which is necessary for correct transmission and dissemination of knowledge. As a result of this encouragement to quality education, the NUS (National University of Singapore) now stands among the best in the world.

One of the initiatives used to achieve this consists of giving teachers from schools and universities work experience in companies, to help them continuously access new developments which can then be applied in the classroom.

Schools and universities have independent management and funding, and the success of innovative initiatives has been promoted within the educational environment, by recognising and rewarding the best project ideas.

The use of new technologies and communications has been facilitated to the students in order that they become familiar with these from a very early age. It is also considered important for children to experience healthy competition from an early age, thus stimulating their desire to investigate to improve with others in an environment of collaboration.

This type of system, which has helped raise the country's competitiveness and productivity rates, has been recognised by the United Nations as an "example of the economic growth that can be achieved through the promotion of knowledge through education"[21].

21. See *http://www.onucolombia.org/semana%2031%20al%204%20Noviembre.htm.*

Ireland: policies of support to investment

Ireland has managed to turn its economy round, going from being one of the poorest countries in the Europe of the Twelve in the early 1980s to the current situation where it enjoys one of the highest levels of income per capita in the European Union and has the second highest rate of business activity in the world, only slightly behind the United States, according to the annual report of the Global Entrepreneurship Monitor.

The explanation for this dramatic climb up the wealth tables ("the Irish Miracle") lies in a combination of liberalising measures and fiscal incentives, taken in the late 1980s, in conjunction with educational reforms and a determination to orient the economy towards innovation.

In order to analyse this development, we need to go back to 1987, when, faced with a complicated economic situation, government, workers and employers devised a major national agreement known as the Social Partnership. This made possible the implementation of a profound macroeconomic and fiscal reforms and establish an employment agreement which limited real growth in salaries in exchange for job stability in the public sector and reductions in private income tax.

In the mid 1980s, **the markets were deregulated** and the door was opened to foreign investment, trade and labour force, turning Ireland into what it is today, one of the freest and most open economies in the world.

The Irish government identified **high tech industries** and certain services (including those linked to health care and telemarketing) as its main development targets because of their greater capacity to attract foreign currencies and jobs. The idea was to identify industries in which the country could develop competitive advantages, in order to promote them and attract the necessary domestic and foreign investment.

Ireland, the "Celtic tiger", became an attractive destination for foreign companies because of its **moderate tax burden** and its advanced telecommunications system, which has encouraged foreign businesses, especially North American, hi-tech and computing firms, to set up in the country.

From there on, the government changed its position on project financing, from support for individual initiatives to the development of a **system of clusters** of excellence which would allow a network to be created between technology companies, activities in the area of education and research and suppliers of venture capital. This was backed by an increase in financing for R&D in universities with a framework that encourages competition.

Educational policies have focused on achieving **high university qualifications**, through support for technological research and encouragement for science and technology degrees, to achieve the goal of attracting the world's leading technology companies.

One example is the North American firm Intel, which has set up the largest microchip production plant outside the US at the Collinstown industrial estate, in which it has invested over seven billion euro in recent years.

All of these measures have turned Ireland into one of the countries with the highest economic growth in the world in recent years; its GDP per capita has gone from being less than 90% of the EU average at the beginning of the 1990s to around 120% at present, only exceeded by Luxembourg.

3.4.4. Public initiatives

Most experts on economy and business management and politicians agree on the need for innovation in our society as a means of maintaining and improving competitiveness. As a result, the European Community is making a major effort to support and encourage innovation.

Public-sector initiatives in research and technological development are especially relevant when it comes to choosing the most viable projects and allocating them the resources they need to succeed. The programmes developed by national and international institutions create the basis for ensuring sustained investment and constant results in RTD, which can also arouse interest among other organisations.

Europe

The Lisbon Strategy (2000-2010)

The European Council meeting held in Lisbon in 2000 drew up a number of targets, which came to be known collectively as the "Lisbon Strategy". The purpose of the strategy is **to turn the European economy into the world's most competitive and dynamic** in just ten years. Innovation, defined as "successful production, assimilation and exploitation of novelty in the economic and social spheres"[22], constitutes the central axis of the project.

The aims of this project in the European area are economic. growth, competitive internationalisation of the private sector, intensive knowledge of the European economy, high employment levels in all areas, a reduction in social exclusion and poverty and a fiscally sustained social system in the medium and long term.

22. See *http://europa.eu/scadplus/leg/es/lvb/n26021.htm.*

Various assessments suggest that the Lisbon Strategy is running behind target as a result of under-involvement by member states. Based on a range of recommendations, the European Union has subsequently developed several program-

mes, such as the Competitiveness and Innovation Framework Programme (CIP) (2007-2013) and the Seventh Framework Programme, in order to improve implementation of the measures and achieve some real progress.

Seventh RTD Framework Programme (2007-2013)

The purpose of the Seventh Framework Programme is to revive the Lisbon Strategy, intended to turn Europe into "the most competitive and dynamic knowledge-based economy in the world" by 2010, and The Sixth Framework Programme on the construction of the European Research Area (ERA), which focuses on creating a European science and technology market.

The Seventh RTD Framework Programme (or FP7), an initiative of the European Commission, focuses on sustaining research initiatives in priority areas which can lead the European Union to be a world leader in these areas and to consolidate its position in others. It includes four main programmes plus a specific fifth one on nuclear research:

- "Cooperation": focuses on collaboration between various countries in research activities in multiple industries.
- "Ideas": focuses on basic research through the European Research Council and finances high quality projects in all fields of science.
- "People": targets initiatives that promote training, mobility and development of European researchers.
- "Capacities": includes several areas of activity to improve research competences.
- Nuclear research and training (ITER) and the Joint Research Centre (EUROATOM).

The European Commission's budget is €50.5 billion for a seven year period (41% larger than the Sixth Programme).

Competitiveness and Innovation Framework Programme (CIP) (2007-2013)

Competitiveness and innovation in Europe will be backed not only by the Seventh Framework Programme of research actions and technological development, but also by the CIP. These programmes will be complementary and mutually reinforcing. Both are aimed at meeting Lisbon targets.

The CIP was created in response to an assessment arising out of the Lisbon Strategy which suggested a need for simpler, more viable and more visible actions, directed towards an increase in growth and employment. The programme is intended to improve processes, contribute new ideas and see innovation from other points of view, based on existing programmes and structures.

The CIP was approved in June 2006, with a total budget of €3.6 billion for the period 2007-2013, with the goal of promoting innovation and growth in approximately 350,000 SMEs.

Spain

Spain has one of the lowest innovation rates in the European Union. In order to try to fill this gap, several policies and measures have been adopted in keeping with the targets of the Lisbon Strategy, the CIP and FP7. A number of institutions and programmes have also been set up to develop the RDI industry in Spain.

Centro para el Desarrollo Tecnológico Industrial (CDTI)

The Centre for Industrial Technological Design is a public entity that depends of the Ministry of Industry, Tourism and Commerce, whose aim is to **improve innovation and technological development in Spanish companies**. It carries out the following activities: assessment of the viability of RDI projects, coordination of Spanish participation in international programmes, promotion of international technology transfer and support to technology-based companies.

The CDTI is based in Madrid and has a network of international offices to support technological activities and the development of Spanish companies in Spain and abroad.

The CDTI's relations with third parties are governed by private law, allowing the centre to offer services of support for developing projects flexibly and smoothly. The CDTI finances projects through its own resources and facilitates access to third-party funding for domestic and international research and development projects.

Ingenio 2010

It is a programme developed by the Spanish government to **increase investment in R&D** over coming years, with a view to meeting a target of 2% of GDP in 2010, 55% of which will come from the private sector. From 2010 on, it is planned to have at least 1,300 PhDs a year joining the private sector and to increase the creation of technology companies from the area of public research to a minimum of 130 new companies per year. The government also wants Spain to reach the EU average in terms of percentage of GDP spent on ICT: from 4.8 in 2004 to 7% by 2010.

The Ingenio 2010 programme involves improving the management of existing policies and focusing additional resources on strategic actions to achieve more ambitious targets, as shown in Illustration 11.

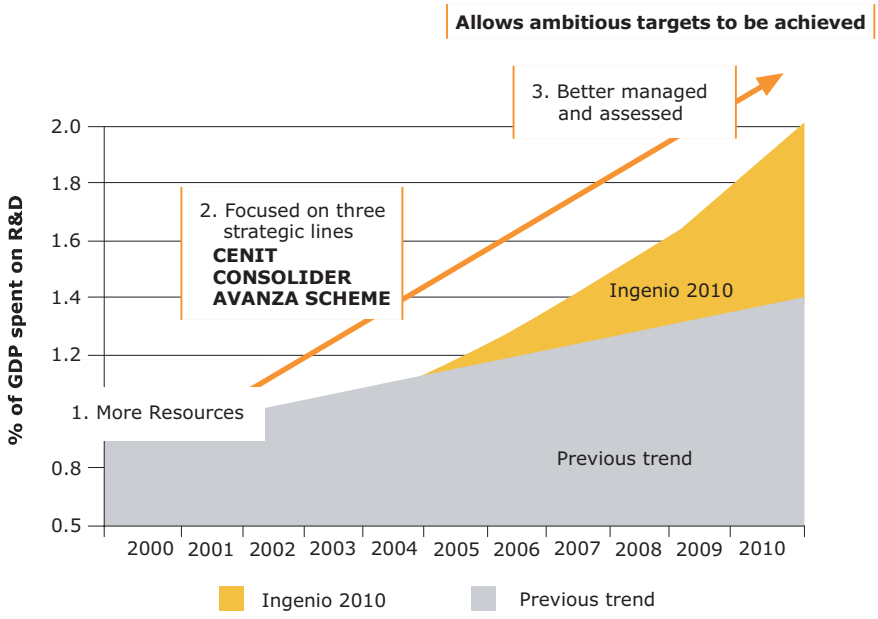


Illustration 11: R&D expenditure with the Ingenio 2010 programme.
Source: Office of the Prime Minister.

The Ingenio 2010 programme seeks to involve the State, business, universities and other public entities to help improve Spain's performance in the area of R&D. In achieving these goals, it will use the following instruments: more public resources (minimum annual increase of 25%), new initiatives (CENIT, CONSOLIDER and the AVANZ@ plan) and improvement in processes for approval and obtention of funding.

CENIT programme

The CENIT programme (Consorcios Estratégicos Nacionales en Investigación Técnica - Strategic Domestic Consortia in Technical Research), coordinated by the CDTI, focuses on **funding large industrial research projects**, with a strategic approach and projection for the future. Its aim is to develop new products, processes and services using integrated technologies to offer Spanish companies a competitive advantage. It also seeks to favour participation of small companies in large projects.

The programme needs a broad basis of resources from various scientific and technological areas, involving both public and private institutions.

The CENIT programme has two lines of action. The first comprises the CENIT projects, which are contractual long term collaboration agreements between public and private research groups in a joint research programme on various areas, such as bio-medicine, information and communication technology, environment, etc. The other line of action, known as the Fund of Funds, seeks to answer the problem of a lack of private investment in the €0.1 - 2 million bracket amongst technology companies.

CONSOLIDER programme

The aim of the programme is **to increase the volume and quality of research** using four instruments:

1.- CONSOLIDER: focuses on increasing the average size of research groups and the participation of public institutions in the Framework Programme.

2.- CIBER: centres on research in bio-medicine and health sciences.

3.- I^3 *(Incentivization, Incorporation and Intensification):* is targeted at integration of leading teachers in the Spanish scientific/technological system.

4.- Strategic fund of scientific and technological infrastructures: intended to build world class science and technology facilities.

AVANZ@ plan

The aim of this programme is **to meet the European average on Information Society indicators,** through the promotion of usage of the Internet and its tools in four key segments: citizens, SMEs, e-government and education.

Unfinished business

As we have seen throughout this chapter, nearly all innovation-related public initiatives in Europe and Spain focus primarily on investment in research and development, despite the fact that this is just one of the factors that can favour innovation (especially in the area of science and technology, if it is carried out effectively).

As we shall see in the experts' conclusions, public initiatives must not only be oriented towards R&D expenditure, but also require a **change in track**, a change of culture and the establishment of a proper legal framework to encourage innovation.

The bulk of public initiative must centre on aspects such as **education**, to help create an innovating culture that will assume failure as a learning experience, and reward and publicly recognise people with successful initiatives.

The challenge we face, of moving from a very conservative culture which looks for grants or stable employment to a society with an entrepreneurial and business sprit that looks for continuous improvement, is no easy one. We need to invest in the long term, following the example of emerging countries such as Singapore, that has been capable of managing the long term in such a way that that it now stands among the world's top countries in terms of competitiveness.

In conclusion, focusing measures to encourage innovation and an improvement in competitiveness in R&D means failing to understand the complexity of establishing the right scenario for performing innovative activities.

3.5. In the business area

As we have seen, the only certainty organisations face today is **change**, reflected in a wide array of new factors: new competitors, new markets, new channels, new needs, etc. Paradoxically, organisations have to address all these changes and, at the same time, continue to satisfy conventional needs: sustainable and profitable growth, increased value for shareholders, customer satisfaction, improvement in loyalty and efficiency, etc.

In order to face up to this global, competitive and changing environment, organisations can use a range of instruments to generate value (branding, strategic resources, structure of the organisation, etc.), but the only tool that will allow them to create a competitive advantage that will guarantee sustainable growth is innovation.

The company must be capable of coordinating the innovation programmes with strategic initiatives and of creating a culture of collaboration, learning and continuous improvement. This means applying ideas, both in technology and strategy and in processes and services, which are capable of offering powerful and innovative results.

According to FTF experts, the main reasons for which a company innovates are a **search for competitive advantage, need for differentiation, creation of wealth** and **sustainable growth.** They also consider the following to be major objectives of innovation: improvement in productivity, retention of talent, survival, opening of new markets, development of brands and the search for solutions and applications of new technologies.

Innovation has a strategic dimension...

From a strategic perspective, innovation might be interpreted as being a systematic process for the **creation and development of competitive advantages**, with a medium and long term orientation. In this sense, innovation and strategy are directly related. Amongst the most important reasons for the failure of innovation actions are a lack of alignment with company strategy and insufficient available resources. It is therefore essential that the company's senior management should approach innovation as a strategic process from a global perspective. The time lag between consumption of resources in innovation and obtention of tangible results must be seen as an **investment in future success options.**

A company's capacity for innovation is above all a **cultural** question. To make the most out of innovation a company need to be steeped in it; we have to realise that the basis of our success today may vanish tomorrow and have to be replaced by something new or, otherwise if the company is not go into decline. We need to be conscious that if the organisation remains in a static position, it will be overtaken in the race to the market: **no competitive advantage lasts for ever.**

Experience clearly shows that organisations that fail to develop a suitable capacity for change suffer a significant reduction in their competitive capacity. We can also see that no organisation, regardless of its size or market position, is immune to this process of change in which we are all immersed. One example: less than half of the companies in the *Fortune 500*[23] in the mid 1970s are still on the list.

Senior management within organisations must promote innovation with a view to integrating it within their organisational model, by setting specific targets, integrated policies and incentives and through a defined system of management backed by an effective communication system. In short, the leaders must make innovation a natural part of the organisation.

Innovation needs to be managed...

An innovating company is one that manages its innovation process systematically like any other process in the business. Innovation management is a discipline that has to be learned and practised.

Professor Gary Hamel, of the London Business School, argues that without continuous management of innovation it is difficult for companies to achieve sustainable growth. The processes affected by this management, FTF experts believe, are knowledge management (including talent management and an analysis of the barriers to the generation of ideas), strategic planning (alignment of innovation actions with the company's strategic objectives), the involvement of management (if a company's management staff do not understand the impor-

23. See *http://money.cnn.com/magazines/fortune/fortune500_archive/letters/A.html.*

tance of innovation they are unlikely to be committed to it), employee assessment, budget and project management.

As we have already seen, organisations depend on innovation for their long term survival, although the innovation process is run through with **uncertainty, risks, surprises** and **mistakes.** Management need to approach innovation from a new perspective, realising that it is no random occurrence, but a critical operative process, a process with specific steps which, if properly controlled and managed, can bring predictable results.

In order to implement a suitable innovative policy, it is a good idea to follow a methodological model that leads to the creation and subsequent development of an **innovation plan** in line with business strategy which includes the specific projects that have to be carried out (approach, duration, budget and development). This requires new management capacities and skills among managers; this including senior managers, and not just those with technical responsibilities. Precisely what characterises an innovating company is the fact it makes innovation an everyday event, not a set of isolated and disconnected actions.

The innovation plan must be **ambitious**, but at the same time must be consistent with **accessible resources** and focus on a series of **key projects**, from which competitive advantage can be expected to accrue. The creation of proposals for innovation projects arises out of strategic deliberation and, within it, from an analysis of a whole series of potential sources of innovation.

According to the FTF experts, the relative weight of each of the potential sources of innovation in a company is conditioned, inter alia, by the size of the company. While R&D is the main source of innovation in large companies, SMEs are much more receptive to customer's needs, because they are more flexible and more sensitive to demand.

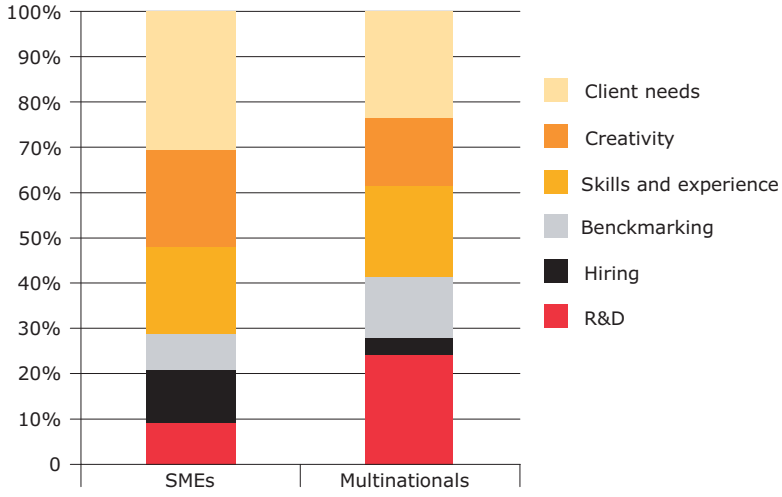


Illustration 12: Sources of innovation in a company according to its size.
Source: Drawn from conclusions within the Future Trends Forum.

Peter Drucker[24] identifies seven sources of innovation which companies need to be alert to: the unexpected (unexpected successes or failures, events, etc.), incongruities (discrepancy between the reality and what one presumes it to be or between what it is and what it should be), to process needs, new findings, needs created on the market, changes in society and demographic changes.

Once the projects of innovation have been identified, they need to be prioritised and selected in a formal process. It is just as important for the success of innovation to take on the right innovation projects as to carry them out properly. This requires using techniques that are adapted for managing innovation projects and take into account their specific characteristics: greater uncertainty, medium and long term goals, shared resources, etc.

3.5.1. Private initiatives

We have already seen that all innovation processes involve a certain degree of uncertainty and risk. On the basis of this premise, the purpose of the public sector in terms of funding must be to attract private capital towards the most innovative industries and areas, not to play the role of a venture investor with public resources.

Spain needs to replace a grant culture with an **investment culture**, in which all capital invested is expected to give returns in direct proportion to the risk assumed, whether the investment is public or private.

Clearly, the assumption of large risks will come from private initiative, that has the mechanisms of control of investment needed to obtain high returns on investment.

This type of high-risk investment or project also requires experts who know how to assess and select the best ideas or projects for financing (venture capital) or even for developing them to final commercial success (business angels and incubators).

In any case, although government intervention must be kept to a minimum, on occasions a certain initial investment from the public sector (fund of funds) is needed to attract private investors, though it is important not to lose sight of the fact that "it is private initiative which has to pull the innovation cart", in the words of José María Zabala, chairman and general manager of the consultancy firm Asesoría Industrial Zabala.

24. Drucker, Peter F. (1985): "Innovative and Entrepreneurship, Practice and Principles".

Venture capital

In its overall concept, venture capital consists of taking a share in unlisted companies, in order to reinforce their equity. The goal of the investor is to implement the strategy plan defined by the company management, make a medium-term return on its investment (between three and seven years) and eventually withdraw from the project. This investment can also be put into a new company which, by its very nature, might be considered to be a high risk activity. Precisely for this reason, the expected return may also be very high.

The concept of risk capital encompasses **two meanings...**

- *Venture Capital*: temporary and minority investment in companies at start-up or expansion stage (often with a high technological content).

- *Private equity*: temporary investment in consolidated companies; purchasing or supporting a purchase.

... and various **types of investment...**

- Seed: provision of resources at some phase prior to mass production (research, design, prototype, etc.).

- Start-up: initial funding ranging from initial marketing of the product or service to the threshold of profitability or break-even point.

- Expansion: funding for the growth of a profitable company.

- Leveraged/management buy-out and management buy-in: purchase of companies in which a substantial part of the price of the operation is financed with debt, partly guaranteed with the assets of company acquired, and partly, with securities which lie half-way between own and external resources.

- Turnaround: financing of a change in direction for a company in difficulties.

- Replacement capital: the role of the financial investor will be to replace a group of shareholders, generally passive (only wishing to maximise dividends in the short term), to give the company a renewed drive.

... with different **types of investors:**

- *Business angels*: private individuals, normally successful businesspeople, who invest in high risk and high growth companies during their first stages (seed and start-up investors), and who add value by providing practical business guidance.

- *Venture capitalists*:professional and specialist investors, who focus on the start-up and expansion phases.

- *Private equity houses*: professional and specialist investors, normally focusing on the expansion phases and the final phases of large companies.

Illustration 13 shows the structure of the venture capital market from the point of view of supply, demand and intermediation.

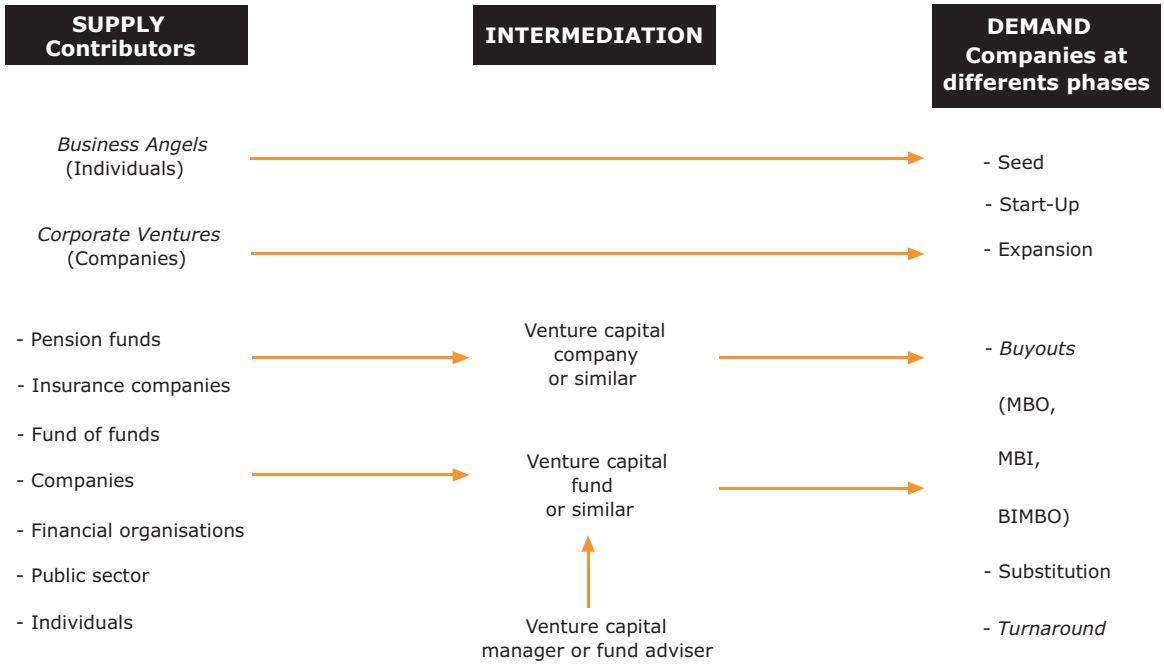


Illustration 13: Structure of venture capital market.
Source: José Martí Pellón. Capital riesgo y capital desarrollo. June 2005.

Venture Capital has an important effect on the company. On the one hand, from a financial perspective, it contributes to increasing equity, which may additionally be accompanied by long term external funding and it also increases financial credibility and reliability. At the same time, from an internal perspective, it contributes experience in business management, normally without interventionism, supports internationalisation and enables the provision of new capital. Summing up, it adds **prestige** and **value** for the company.

The right framework which has to exist for venture capital to thrive is that of a large domestic market with a favourable environment for doing business in various aspects, ranging from socio and cultural factors to administrative and fiscal ones, with the treatment of profits.

The role of the public sector as a venture capital investor should be limited to meeting uncovered needs (initial stages, less favoured technology and areas) and seeking to provide incentives for direct participation by private individuals through tax incentives for investment and a competitive treatment of profit, creation of networks for collective investment, etc.

A strong incentive for innovation...

Venture Capital and Private Equity are galvanising factors that have an important impact on innovation and economic growth.

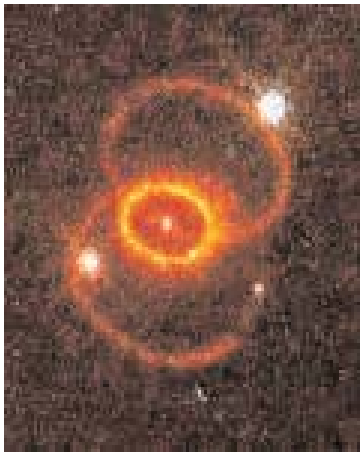
A study[25] by economists Samuel Korton and Josh Lerner, published by the US National Bureau of Economic Research, seeks to demonstrate that venture capital encourages innovation. Korton and Lerner studied the influence of venture capital financing on the number of patents filed (an indicator of technological innovation) by 530 companies, backed through traditional funding and venture capital, in twenty different US industries over a period of thirty years.

The economists concluded that the degree of venture capital activity in an industry leads to a significant increase in the number of products patented. Their results show that, whereas the ratio of venture capital to expenditure on research and development is less than 3%, venture capital accounts for approximately 15% of all patents of industrial innovation.

In short, the same amount of money is far more likely to encourage technological innovation when it is invested in venture capital than when it is given over to the research and development budget of a large company.

Other studies conducted using the databases of hundreds of companies also corroborate the idea that "the greater the amount of venture capital invested, the greater the rate of innovation of the investing company, expressed in terms of the number of patents". Gary Dushnitsky, professor of management at the

25. See *http://www.baquia.com/noticias.php?id=7209.*



Wharton School, University of Pennsylvania, argues that corporate venture capital is an essential tool which companies can use to increase innovation, especially in the most technological industries.

Business Angels

A business angel is normally a person who was once a successful entrepreneur, with **investment capacity**, and who uses his or her money, **experience** and **network of contacts** to invest in new business projects, primarily technological ones with a high potential, which are beginning their activities (seed capital). This figure meets a need for funding small innovative companies at the initial stages, not covered by the traditional financial system.

The business angel not only provides capital, but also gets fully involved in the management of the company, transferring his or her knowledge to the new entrepreneurs and enjoying the entrepreneurial spirit typical of new projects. The entry of a business angel into a company's capital facilitates subsequent access to other sources of funding, such as venture capital and banking loans.

Although business angels do not conform to a single profile, there are some common features:

They are normally natural persons, mostly men, aged between 45 and 65, or small groups of investors who generally prefer to remain anonymous. The more expert they are, the more they invest as a syndicate with other business angels.

- They are individuals with investment capacity. They invest between €25,000 and €250,000 per project and participate in an average of three projects per year.
- They normally take a holding of around 25% of the equity of the new company and never more than 50%.
- They tend to be highly academically qualified.
- They have seen the role of their investors when they were entrepreneurs themselves.
- They mostly invest in projects that they have heard about through their network of personal and professional contacts.

Many business angels operate as part of **Business Angel Networks (BANs)** which channel the supply and demand of capital and, therefore, facilitate contact between investors and entrepreneurs. These networks mostly operate at a regional level and have developed enormously over the last ten years (there are now about 305 operating in Europe).

BANs also serve to speed up and increase the search for potential projects and initiatives, making it possible to reach a critical mass of projects and companies in which they can invest.

Projects can be captured through different mediums: universities, business schools, company incubators, technology parks, etc. Once they have been chosen, they are analysed and those that have little chance of funding are rejected. Potential business angels are also selected and their capacity and expectations for investment in high-risk projects are studied.

Not all BANs have the same management model: some take the form of an informal club with no definite legal structure while others are trading companies. They can be general or specialist, the latter being the ones which are of most value to the entrepreneur. They bring together capital and experience and talent, and encourage the creation of wealth and employment.

Business incubators

If innovation is to have a real impact, it is not enough just to have a revolutionary idea; you also need to be capable of carrying it out, of turning it into a product with large-scale application and acceptance. The role of incubators is precisely to guarantee that the best ideas are turned into successful companies. Incubators are innovative in their concept of bringing together a team with great experience in selection, support, supervision and assessment of **ideas** at an embryonic phase.

They are capable of choosing the ones with **high potential** and offering all **necessary resources** to turn them into solid companies with revolutionary products that have **broad possibilities for development and growth.**

Incubators have certain resources administered by experts with the capacity to guide other less expert people, but with good ideas. There is a transfer of know-how from business innovators to new entrepreneurs with ideas.

They offer services such as: physical space (offices or laboratories), shared secretarial services, advice, management of contacts for possible alliances and search for funding, among others.

Among their other functions, incubators diagnose the failings of new companies looking for solutions and corrective measures that will allow them to move on to new stages of development. This enables many of the incubated companies to emerge and survive successfully after this period is over. They are interested in projects with potential, which must therefore meet certain essential characteristics, of which the most important are:

- Innovation: the idea must be innovative.
- Market: for preference the target market should be new or have little competition.
- Technology: they use value-generating technology.
- Viability: appealing yield on investment.

Another important characteristic is that they must be projects with key competitive advantages, focusing on global markets.

Another critical feature to be taken into account is the level of commitment of the person or people making up the team. Most incubators require the entrepreneur to commit part of the resources, and to train in those skills where there are the greatest shortfalls.

Some incubators try to incorporate the university into the business world, thus increasing the possibility of creating innovative companies as a result of business promotion between teachers and students.

Most companies born in incubators relocate nearby, an advantage when it comes to developing technology parks. The centres allow strategies of cooperation and clusters to be promoted as a way of developing the business fabric.

In short, business incubators are a strategic element for national innovation policy: they favour the development of an industry or sector of companies with intensive knowledge (of science, technology or market), are strongly oriented towards regional development and are characterised by a search for innovation.

Clusters

Over the last two decades, the public and private sector have become aware of the importance of microeconomic conditions and factors and the role of clusters in the economy and, more specifically, in industrial development, innovation, competitiveness and economic growth.

There is no unique definition of cluster. Michael Porter, who popularised the concept in 1990, defined it as a geographical concentration of companies and institutions within a specific industry linked by common and complementary practices. Porter divided them into vertical clusters, made up of industries linked by buyer-seller relations, and horizontal clusters, consisting of industries that share a common market for their final product, use a common technology or labour force or require similar natural resources.

The lack of a single definition of the concept of the cluster may help us understand the difficulty in finding a standard method to identify clusters. There is a tendency to identify the presence of a cluster using methods of quantitative analysis. However, a qualitative examination needs to be made to determine the type of relations that exist between the component industries.

A clear and recognised example of a cluster is Silicon Valley, a region in which several successful computing and IT companies emerged in the second half of the 1990s. The result was that anyone launching a start-up project in the industry tended to set up in this region and the growing number of such companies encouraged many venture capital companies to do the same. This concentration of companies also attracted an important number of professionals from the industry.

Why do clusters work? According to Porter, they encourage competition, co-operation, links and informal dealings between companies and institutions. Through them, companies have access to the advantages that come from joint action: cooperation agreements that allow them to take advantage of economies of scale and scope, flexibility and speed of reaction (with lower coordination and transaction costs), innovation networks (greater number of initiatives and options, sharing risks and costs), etc. In addition, the companies have to co-operate, but also compete. Such constant, visible and accessible comparisons between companies (because of their physical proximity) are a strong incentive for improvement. The **cooperation/competition** dynamic is fundamental. As a result, clusters increase the productivity and efficiency of the companies in them.

Clusters are also **innovation drivers** for various reasons, including: increase in productivity (ease of coordination between companies, rapid dissemination of best practices, etc.), stimulus to innovation (better perception of opportunities for innovation, creation of knowledge thanks to help from multiple suppliers and institutions, ease of experimentation, etc.) and ease of marketing (opportunities for new companies are more visible and barriers for entering cluster-related business are lower). Competition between companies in the cluster is also an important factor in encouraging innovation, accentuating the ties between companies, industries and institutions.

The reasons cited above aroused interest in clusters in different regions of the world. Policies were implemented to encourage innovation and increase the productivity and competitiveness of the region in which they were located.

However, although the benefits of clusters have been recognised, there have been few examples of specific policies for promoting clusters in Spain and elsewhere in Europe.

3.5.2. Innovation by industry

There are major differences in levels of innovation from one industry to another. The European Commission, through its EIS (European Innovation Scoreboard) report 2005 has creating an index (see below), for measuring innovation in Europe by industry.

This analysis has been developed using 12 indicators[26] for a total of 25 industries in 15 European countries[27].

#	Indicator	Source
1	Share of employees with higher education	CIS 3
2	Share of firms that use training	CIS 3
3	R&D expenditures (% of value-added)	OCDE
4	Share of firms that receive pulic subsidies to innovate	CIS 3
5	Share of firms innovating in-house	CIS 3
6	Share of SMEs co-operating whith other	CIS 3
7	Innovation expeditures as a percentage of total turnover	CIS 3
8	Share of total sector from new-to-market products	CIS 3
9	Share of total sector sales from new-to-firm but not new-to-market products	CIS 3
10	Share of firms that patent	CIS 3
11	Share of firms that use trademarks	CIS 3
12	Share of enterprises that use design registrations	CIS 3

Table 3: Innovation indicators by industry.
Source: European Sector Innovation Scoreboards. European Trendchart on Innovation.

The Industry Innovation Scorecard (IIS) is an average figure for innovation in each industry in each country. The results are shown in Illustration 14.

26. Of these 12 indicators, 11 come from CIS-3 (Third Community Innovation Survey).

27. Germany, Austria, Belgium, Denmark, Spain, Finland, France, Greece, Netherlands, Iceland, Italy, Luxembourg, Norway, Portugal and Sweden. No information is available for an analysis of Ireland, the United Kingdom and the other new EU member states.

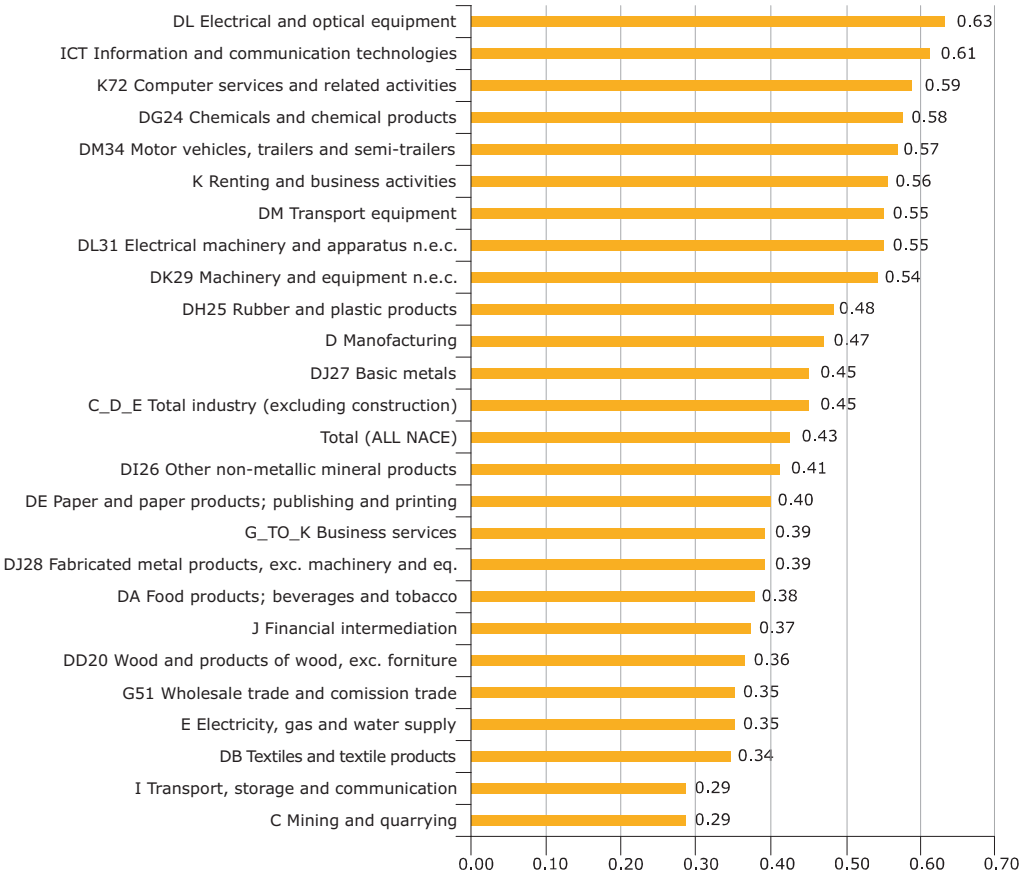


Illustration 14: Industry Innovation Scorecard: Europe.
Source: European Sector Innovation Scoreboards. European Trendchart on Innovation.

According to this analysis, Finland and Germany are the most innovative countries and the leaders in innovation in approximately 15 industries. Small countries such as Austria and Belgium have a high level of innovation in industries such as manufacturing[28].

Although all industries have an impact in a country's level of development, not all have the same weight in its economy. The Conclusions section of this publication analyses the industries in which FTF experts believe, given their context, Spain should focus its efforts in the area of innovation.

28. For more details, see http://www.trendchart.org/scoreboards/scoreboard2005/pdf/EIS%202005.pdf.