

07

# INNOVATION

The Wealth of Nations

FUNDACIÓN DE LA INNOVACIÓN **BANKINTER**

AN  
INQUIRY  
INTO THE  
Nature and Causes  
OF THE  
WEALTH OF NATIONS  
By ADAM SMITH, LL.D and F.R.S.





*High performance. Delivered.*

The Accenture Foundation collaborates with the **Bankinter** Foundation of Innovation to publish the report of the Future Trends Forum (FTF) and to help advertise the work of a leader in independent opinion on global tendencies and innovation. In this sense, Accenture endows the FTF with the whole of its intellectual capital and its expertise in order to make enterprises and institutions to become high-performance organizations.

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# Executive Summary



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

The best way to achieve competitiveness has proven to be to encourage individuals, institutions and companies to learn and innovate.

Gone is the notion of innovation as being purely technical, a view which has been sustained since the Industrial Revolution, and which confined the innovative spirit of businesses to their research and development departments. The challenge now is to **innovate in order to create value** by doing things differently and even by doing radically new things.

Innovation should not be mistaken for research. Research involves the creation of new knowledge, while innovation creates wealth from knowledge, be it new or not.

In order for this innovation to happen, learned or innate personal qualities need to exist (creativity, flexibility, discipline, knowledge, etc.), but there also needs to be an environment in which innovation is encouraged and rewarded, seen as a beneficial aim for society as a whole.

In order to try to encourage an innovative culture in society, it is essential to emphasise its importance in all stages of **education**. It is very important to stimulate competition and research from an early age, as well as incorporating innovation as a discipline within education, making it into a regular part of everyday life, rather than a series of isolated actions.

Just as important as encouraging this innovative culture is the **creation of an environment that favours innovation** and it is precisely the governments and authorities-the players who FTF experts believe have the most important role in the area of innovation-who have to implement the policies necessary for establishing the most suitable legal and administrative framework.

Nor should we forget in this context other essential actors for the development of innovation: on the one hand, business-both multinationals and SMEs-who are responsible for coming up with appealing projects that will attract private investment; and on the other hand, the consumers who play a decisive role in the configuration of demand.

Given that the concept of innovation embraces more than simply the creation of new products, we can see that various types of innovation can exist in the company. These include: innovation in (auxiliary or business) processes, innovation in the brand, channel or customer service, among others.

## Notes

A series of horizontal dotted lines intended for taking notes.

There is no universal consensus on the best way of measuring innovation, but an attempt can be made to measure innovation from a microeconomic perspective, i.e. at a business level, what is the internal effect of an innovation process implemented in the company. In this aspect, measurements are proposed based on turnover or productivity.

At a macroeconomic level, some tools for measuring the innovation capacity of a given industry, country or region might include: spending on R&D, number of patents, technical publications, income from intellectual property right, etc.

Although traditionally the level of innovation of a country has been measured on the basis of its investment in R&D as a share of GDP, it is important to note that **R&D is a necessary factor, but cannot on its own generate innovation** or be a measure of innovation at a macroeconomic level. Rather, it has to be backed by a series of factors which, taken together, form an indicator which may reflect the level of innovation of a given country or region.

Different regions of the world vary considerably in their levels of innovation as a result of historical factors such as: government policies, development of education, business framework, etc. The most innovative countries, according to results published by the European Commission in 2006, are: Finland, Sweden, Switzerland, Japan, Singapore, Israel and United States.

Each of these countries has adopted a strategy on innovation which has also positioned them among the most competitive countries in the world: Singapore, for example, has adopted an education system that encourages competitiveness and research from a very early stage. Israel has made a virtue of necessity, adapting research in defence to civil society and developing important technological advances in the agricultural and environmental industry which it has exported to many other countries. All this, combined with a society with a high level of education, motivated by a will to go further, innovate and undertake new high-risk activities has made this small country one of the most innovative and competitive in the world.

One thing on which most experts on economy and business in Europe agree is the need for innovation in our society as a way of **maintaining and improving competitiveness**. As a result, in the European community for example, a great effort is being made to support and encourage innovation. In any case, nearly all these public initiatives focus primarily on R&D, despite the fact that it is only one of several factors that helps foster innovation.

Europe needs **a change in tack, a change in culture** and the establishment of a proper legal framework to encourage innovation.

At a business level, to face up to this changing competitive global environment, organisations can make use of different instruments to generate value, although innovation is the only tool that enables a competitive advantage to be created

and ensures sustainable growth.

But we should not conclude that it is necessary to innovate just for the sake of innovating. Some of the reasons the FTF experts feel might motivate a company to innovate include: **search for competitive advantages, need for differentiation, creation of wealth and sustainable growth.**

The FTF experts are divided on the need for an innovation manager in the company. Some see this as a necessary figure, alert to market trends, capable of promoting innovation in all areas of the company. Others suggest that it would create greater bureaucracy in large organisations obstructing the flow of ideas from all tiers of the organisation.

Any innovation project involves a certain degree of risk and uncertainty. This is why such projects must essentially be funded by private initiative. 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).

Some of the conclusions presented by the FTF experts seek to offer guidance on ways in which innovation can be encouraged in a country like Spain. If we make a diagnosis of Spain we can conclude that we have the raw material-the talent and the technological infrastructure, but the country has shortfalls especially in the cultural area and it is here that the experts advise that government policies must be oriented towards an increase in investment in quality education encouraging the innovative culture of risk-taking and a business spirit.

One key challenge of the new economy is to encourage an innovative and entrepreneurial culture. This will involve a cultural revolution essentially entailing a **change in the attitude to risk and failure.**

In the present context, a failure to properly take on board the challenge of innovation would mean condemning the country to stagnation and even decline. There is no place for the status quo. It is a question of "Innovate or die" and the process needs to involve not only the business sector, but society as a whole, since it involves an improvement in the social and economic conditions of the population at large.

In an environment in continuous development, undergoing a process of globalisation, technological progress and with the emergence of new world players in Europe and elsewhere, the challenge we face is whether to innovate or not.

Is it necessary for Spain, which has a growth rate of close to 4% per year, despite a gradual erosion of competitiveness, to make a firm commitment to innovation?



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CHAPTER 1

# Foreword

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## 1

## Foreword



**S**ometimes things change... This is the essential starting place for anyone who wants to be an innovation leader. Some people innovate because they cannot stop themselves: after all, we humans are tool builders and tinkerers always looking to make something new and better. But most of us innovate because we must. Something that irritates us can be made less annoying; something that intrigues us can be made compelling. Ultimately when things change in the world we must take action. We improve the known or invent the new because if we don't change we become irrelevant.

Recently leading experts on regional innovation gathered in Madrid to understand the dynamics around innovation in countries ranging from Germany to Israel, Ireland, Singapore, China, India, and Spain. Collectively we explored the conditions that help foster innovation and the role of thoughtful and effective government leaders. The report you hold in your hands provides the insights from their gathering.

### *Innovation is probably different than you think*

Innovation should surprise us. Whether it is the elegant design and pleasure of using an iPod, or the thrilling smoked foam and Parmesan ice cream sandwiches created by Ferran Adrià at el Bulli, true innovation is never obvious, it demands curiosity and rewards courage. But what often comes as a surprise to people trying to master innovation is that the very nature of the field and its practice has fundamentally changed in the last decade or so.

Most of us assume that innovation consists mainly of some hot new product. In fact, the most recent research clearly shows that new products today are swiftly copied in the world and are rarely profitable. Others assume that innovation is fundamentally about creating a proprietary technology. Here again, be prepared for a stunner: all the best technologies today get licensed quickly, in an attempt to make them a global standard.

These are just some of the reasons why it is especially important now to think like a leader when you try to master innovation. Today most great innovations combine many smaller advances into an integral whole that no one has done before. The breakthroughs we all need in healthcare, in transportation, housing, materials sciences, logistics, education, computing, telecommunications, and sustainability across the board are likely to arise when we start to imagine a more coherent and impressive way to live-then pull many known pieces together to make something that provides a startlingly new and better experience.

## Notes

### *Innovation comes in many types*

Great innovation is simple to define but hard to achieve: it is a viable new business concept. The key word here is viable: innovation is never a success until it returns all its developmental costs, including the cost of capital. Moreover it must be able to sustain that viability over time (the reason that mere product ideas or technologies are rarely enough in today's global markets). The innovations that we value now tend to integrate several distinct types of change—from the customer experience to the channel and brand strategies, the processes you invent, the customer service, the way you partner with other firms, and the business model that governs how you are paid. If you carefully orchestrate more of these types of innovation the end result is invariably more dramatic, more appealing for people, and much harder to copy by competitors.

### *The role of governments and leaders in fostering innovation*

Once we agree that innovation is necessary, it is helpful to think through how we should pursue it with confidence and courage. Leaders that want to foster innovation should concentrate on three key goals:

- **First, make sure that your colleagues understand innovation fundamentals:** what it is, where it comes from, how it pays off. This means helping people to abandon the many myths of innovation (like that it is about new products, unbridled creativity, brainstorming and playfulness) to instead substitute logic, discipline, diagnostics and metrics.
- **Second, craft a goal for innovation, an "innovation intent".** This gives your teams a clear mission to innovate around and makes it vastly more likely that your innovation efforts will succeed sooner than become cumulatively more valuable over time.
- **Third, set the conditions so many teams and partners participate and succeed.** This demands great processes for innovation, rewards and incentives to foster active participation, plus metrics to know if, when, and to what degree you are succeeding.

In the special case of governments all three of these principles and challenges still apply. At the same time government leaders owe it to their citizens to carefully consider the balance between directing innovation versus setting the conditions so that the private sector innovates. Both are important, of course. For some of the costliest parts of modern life—healthcare, transportation, education, security, computing and telecommunications—the temptation is often to have the state run these actions directly. For most regions the trade off is a painful, and necessarily political, issue. It often seems fairest to have the government provide these services to citizens, but this can lead to slower patterns of change

and innovation than what is normal when the private sector competes to gain business in open and competitive marketplaces.

*Some observations about innovation in Spain*

The government of Spain is an example of one that has made a deep commitment to providing excellent healthcare, education, and services to citizens. As such, huge sectors of the Spanish economy are dominated by the government. Great business schools are now helping to add leadership skills and building a strong talent pool (and some are increasingly focused directly on innovation). What is most exciting is the profound renewal of key regions (especially Bilbao, Barcelona, and Madrid) and some especially dynamic sectors (restaurants, tourism, hotels and resorts, museums, and healthcare). But there are key challenges too, especially in fostering a robust entrepreneurial culture, fostering more robust venture capital markets, and encouraging more tolerance of failure.

The good news is that these are problems that can be specifically addressed and solved. Some of the fixes are even simple: like fostering a dialogue to select a handful of key innovation themes, creating high profile innovation competitions and awards, and then actively working with schools, financial markets and the press to bring more expertise and attention to innovation in Spain.

Many scientists and historians think we live in the greatest time of change in the history of our species. Certainly in Spain and throughout the EU this is a moment of remarkable transformation. This means that innovation is not an option. If Spain does not innovate, it will fall behind. When Spaniards choose to innovate—as in Bilbao and Barcelona—the whole world notices and celebrates the authentic Spanish triumph that result. Clearly there is no lack of innovation skill in Spain. What is needed most now is a collective will to innovate around a handful of themes the leaders and the people of Spain should select with care, then address with the discipline, persistence and passion that epitomizes Spain at its best.

Larry Keeley  
President, Doblin Inc. (Chicago).

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CHAPTER 2

# Introduction

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## 2

## Introduction



**G**lobalisation and market deregulation are now a reality in our society and economy, both undergoing perpetual development. In itself, a capacity for adaptation is no longer a guarantee of survival. It is vitally important to be able to anticipate change, in order to be able to identify and exploit the business opportunities that may arise in the future. Essential to achieving this objective is an analysis of future trends.

The *Fundación de la Innovación* was created by Bankinter with a clear objective: to influence the present by looking to the future and to stimulate the creation of business opportunities at the cutting edge of technology and management, with a view to promoting innovation in the Spanish business world. This is an ambitious and innovative project, through which Bankinter hopes to stimulate the creation of business opportunities. The project, which seeks to reinforce Bankinter's commitment to society, involves over 160 international multidisciplinary experts and is backed by an exceptional Board of Trustees.

The flagship project of the **Fundación de la Innovación Bankinter** is the Future Trends Forum (FTF), a showcase of the Bankinter culture, founded on innovation and a commitment to all that is vanguard. The FTF is Spain's leading forum on long-term forecasting and innovation, and embraces leading international scientists and intellectuals. It is a multisectorial and multidisciplinary forum for neutral opinion. It seeks to convey all the objectivity of a forum enriched by a range of viewpoints, which remains unbiased and unswayed by interests of any kind.

It works to detect and monitor social, economic and technological trends that may change our current way of life, analysing their impact on current business models in the most strongly affected industries and making recommendations on ways in which benefits can be drawn from this situation. These conclusions are then disseminated in various strategic spheres of society.

The FTF members themselves can propose the issues to be discussed and those finally debated are decided on by vote. The final result of each of these processes is the dissemination of the conclusions reached as a result of surveying employers, professionals, top management, companies and institutions. The results are disseminated through this publication and a range of lectures given in the main Spanish cities.

## Notes



The purpose of this report is to present the results of the analysis of innovation and competitiveness made by FTF, working with its main collaborator, Accenture. The need to be increasingly competitive in a changing and highly globalised environment which is currently undergoing a process of technological development presents a new challenge to society and business: to guarantee sustainability using innovation as a tangible base for developing business differentiation and competitiveness.

The aim of the first section is to define the concept of innovation, diagnose the current situation in the world and analyse its implications and influence on competitiveness and productivity, both at national level and in the business area.

In the second part, "The FTF view of innovation", the experts identify key aspects for improving and encouraging innovation in order to improve competitiveness and allow societies and companies to compete within a new context of globalisation.

Once again, the **Fundación de la Innovación Bankinter** hopes that this new publication will serve as a source of knowledge, but, above all, as a stimulus and guide to professionals and employers from different industries who, to some extent, are being or will be strongly influenced by the need to innovate in order to obtain a competitive advantage in a world increasingly governed by productivity and competitiveness.

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CHAPTER 3

# The challenge of innovation

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## 3

## The challenge of innovation



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 as well 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.

## Notes

### 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 regarded 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<sup>1</sup>).

Illustration 1 shows the dimensions of innovation.

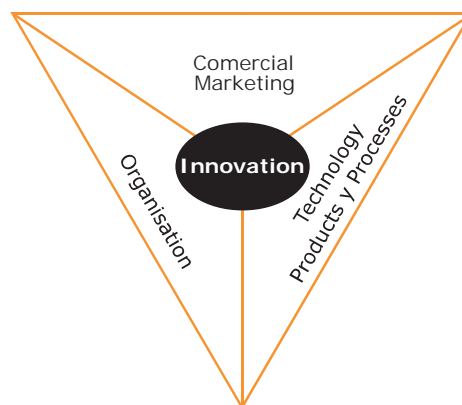
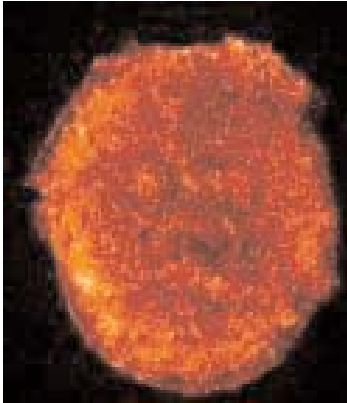


Illustration 1: Dimensions of innovation.  
*Source: Idom Innova.*

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 now 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 Commission<sup>2</sup>, 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](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<sup>3</sup>:

- 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.

#### Notes

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 it 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<sup>4</sup>.

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.

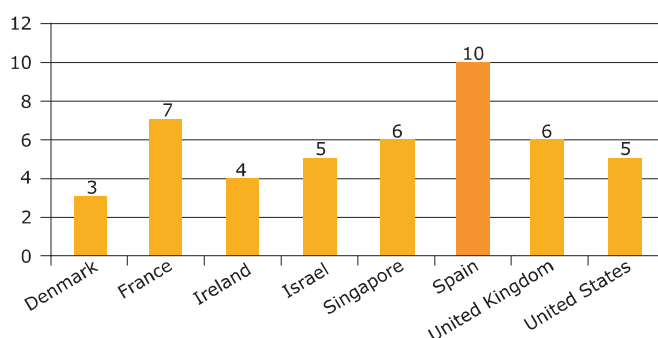


Illustration 2: Number of procedures involved in creating a company.  
*Source: World Bank Group.*

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<sup>5</sup> 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<sup>6</sup>. After all, he said, "companies innovate to satisfy demanding customers".

5. See [http://money.cnn.com/magazines/fortune/fortune500\\_archive/letters/A.html](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 trilogy), 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 bureaucratized 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 whether 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<sup>7</sup>). 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](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<sup>8</sup>, 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<sup>9</sup> 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).

- 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-

Notes

Notes area with a dotted grid pattern.



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**<sup>10</sup>, 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<sup>11</sup>: 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](http://trendchart.cordis.lu/scoreboards/scoreboard2006/pdf/eis_2006_global_innovation_report.pdf).

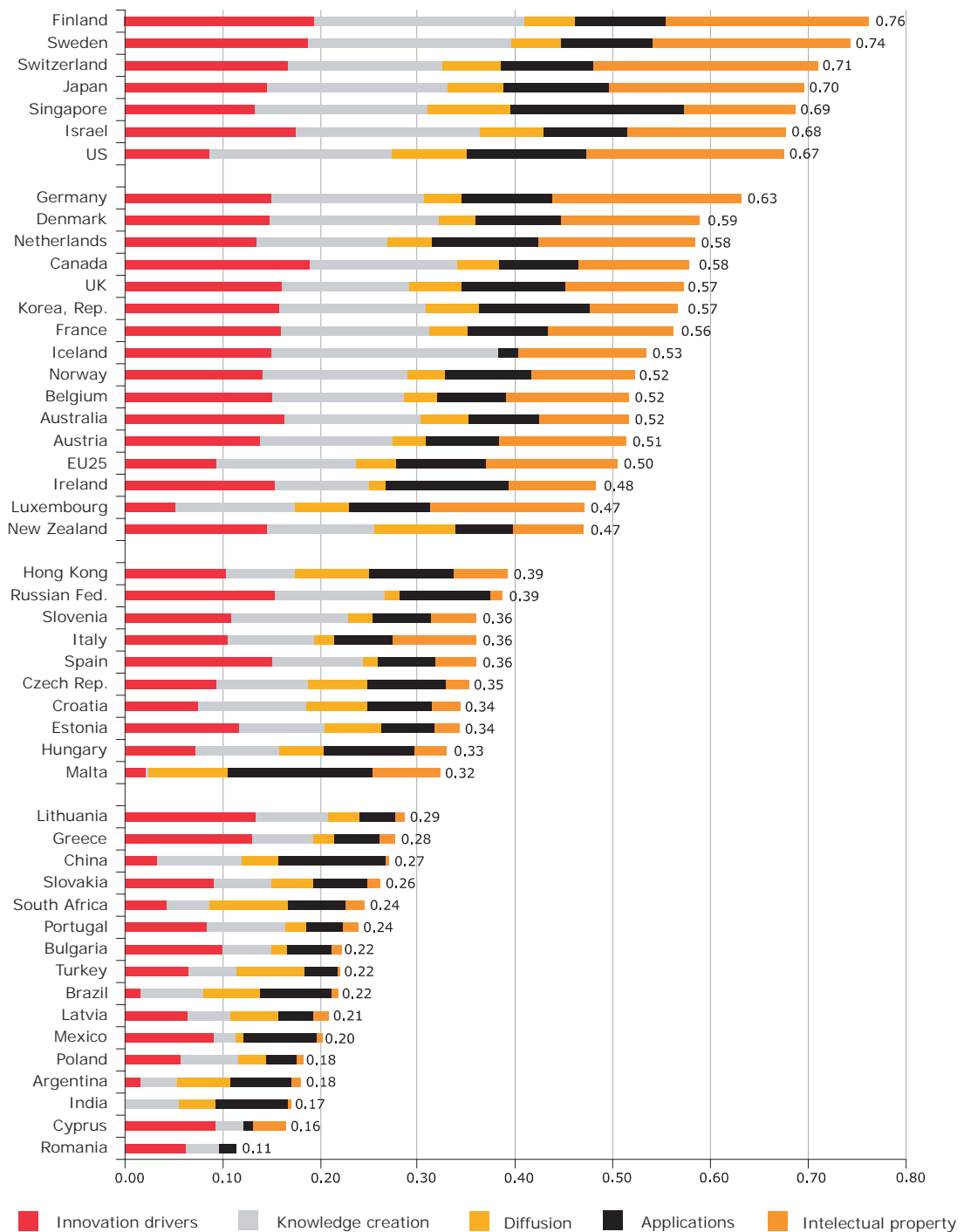


Illustration 3: Innovation scorecard by countries.  
 Source: European Trend Chart on Innovation,  
 "2006 Global Innovation Scoreboard". (GSI) Report.

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).

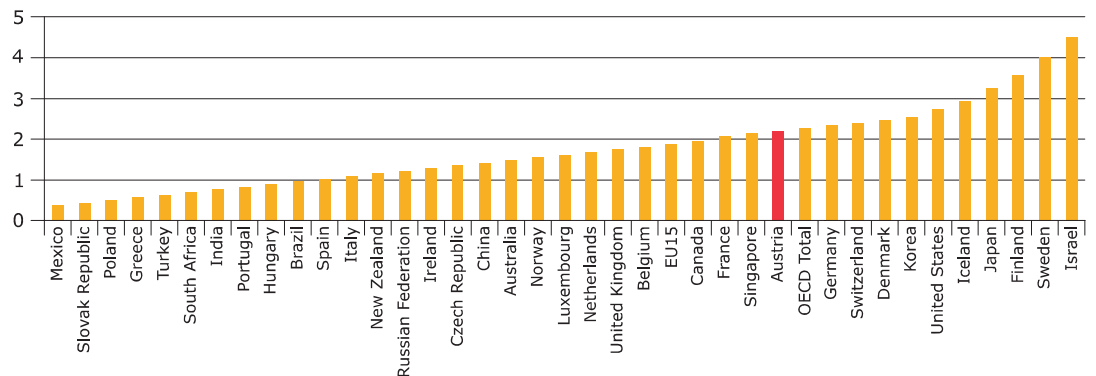


Illustration 4: Investment in R&D as a percentage of GDP by country.  
 Source: OECD Factbook 2006, Gross domestic expenditure on R&D.

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%).

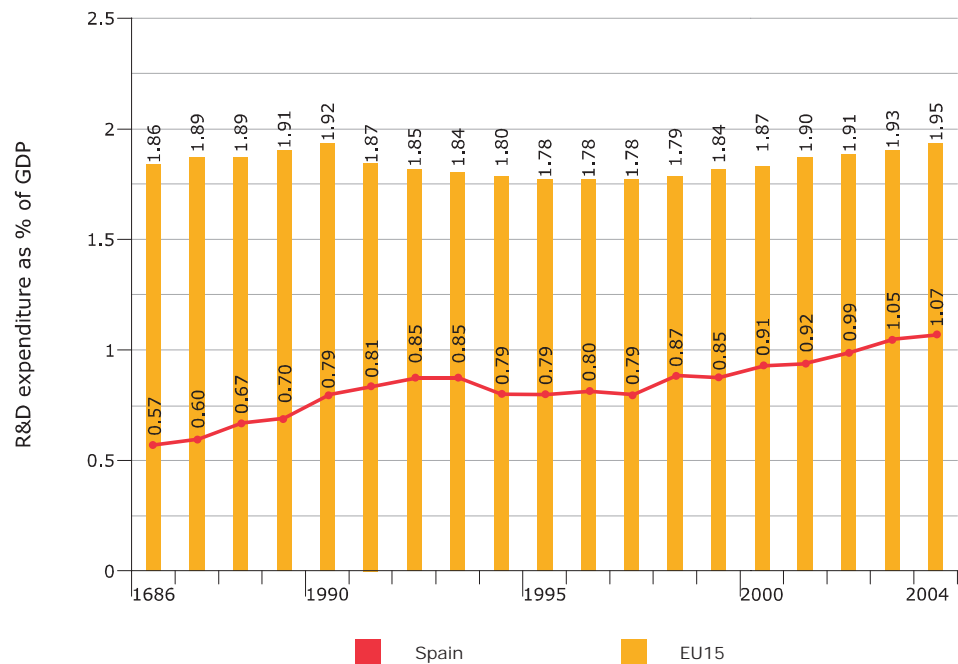


Illustration 5: Investment in R&D as a percentage of GDP in European Union member states.

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 a 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.

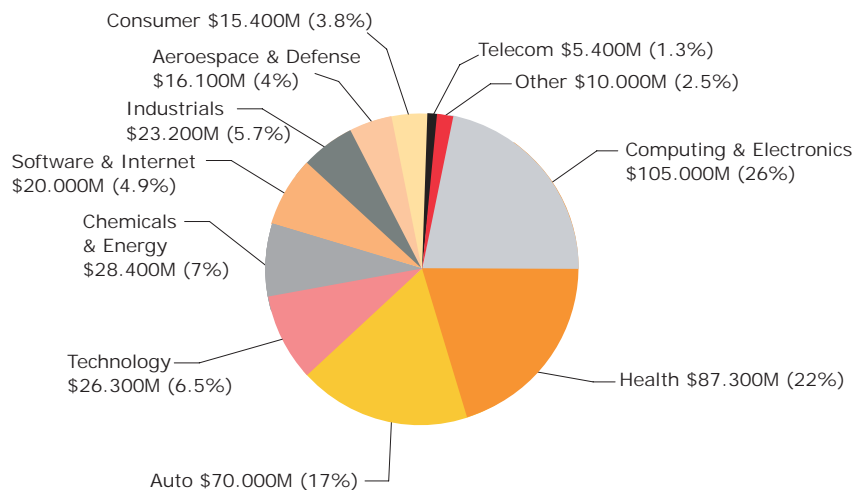
Summing up, it need to be made clear that **R&D on its own cannot generate innovation** nor can it be a measure of innovation at a macroeconomic level, but instead must be backed by a set of factors influencing innovation, which, when combined, form an indicator that may give an idea of the level of 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<sup>12</sup> 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.



**TOTAL: \$407.000 Million**

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](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 Competitiveness 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<sup>13</sup> 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.

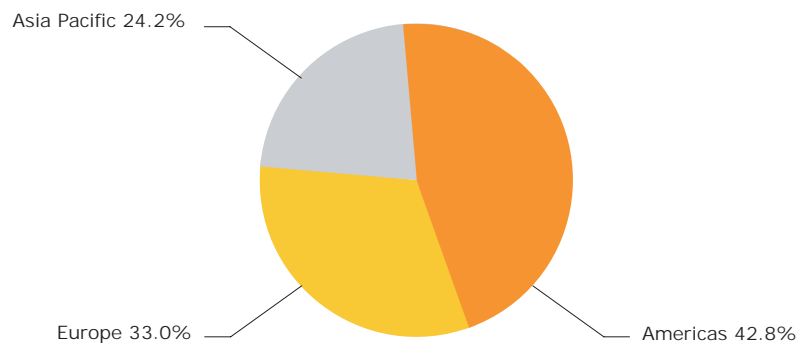


Illustration 7: Distribution of R&D expenditure by regions.  
Source: "2006 The top 800 UK & 1250 Global companies by R&D investment".

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*<sup>14</sup> (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](http://www.innovation.gov.uk/rd_scoreboard/downloads/2006_rd_scoreboard_analysis.pdf).

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

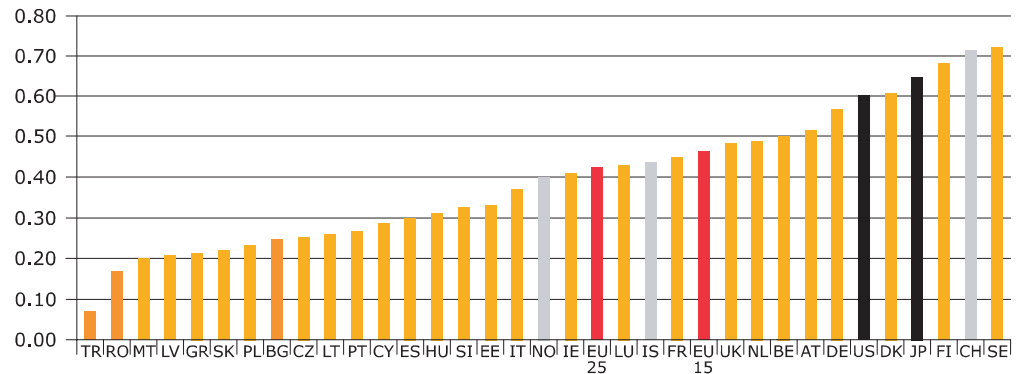


Illustration 8: Innovation scorecard by countries.  
Source: *European Innovation Progress Report 2006. Trendchart.*

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.*

The index includes 26 indicators grouped into five categories<sup>15</sup>: 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.

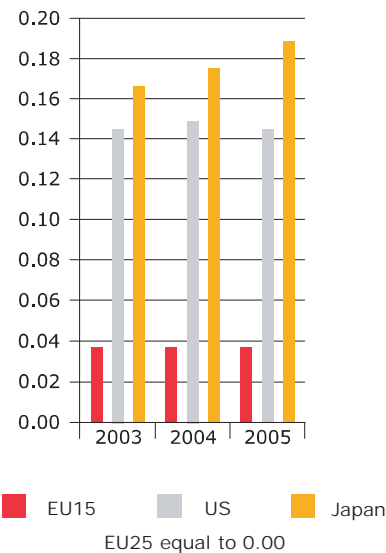


Illustration 9: Innovation gap between the European Union, the United States and Japan.  
 Source: *European Innovation Progress Report 2006. Trendchart.*

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<sup>16</sup>.

#### **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<sup>17</sup> 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<sup>18</sup>, 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>.

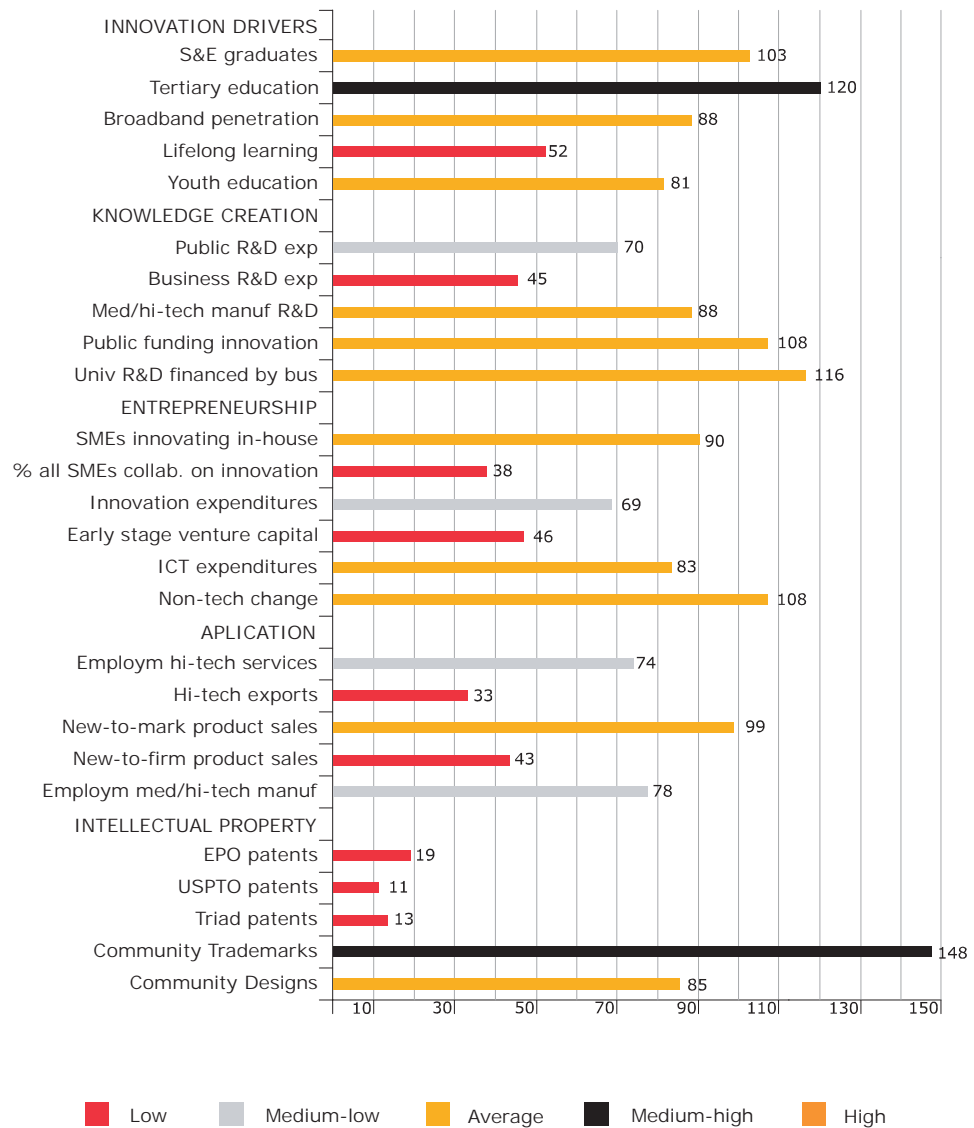


Illustration 10: Breakdown of innovation scorecard: Spain (relative to EU-25 average).  
 Source: *European Innovation Progress Report 2006*. Trendchart.

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 technologists 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<sup>19</sup>.

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](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**<sup>20</sup>. 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"<sup>21</sup>.

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"<sup>22</sup>, 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.

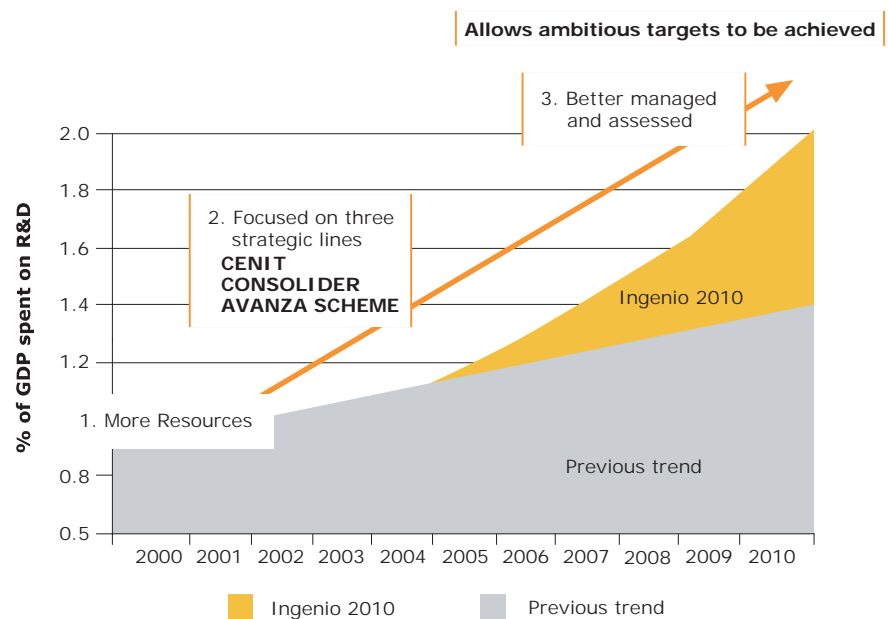


Illustration 11: R&D expenditure with the Ingenio 2010 programme.  
 Source: Office of the Prime Minister.

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 (Consortios 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<sup>3</sup> (*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 spirit 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*<sup>23</sup> 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](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.

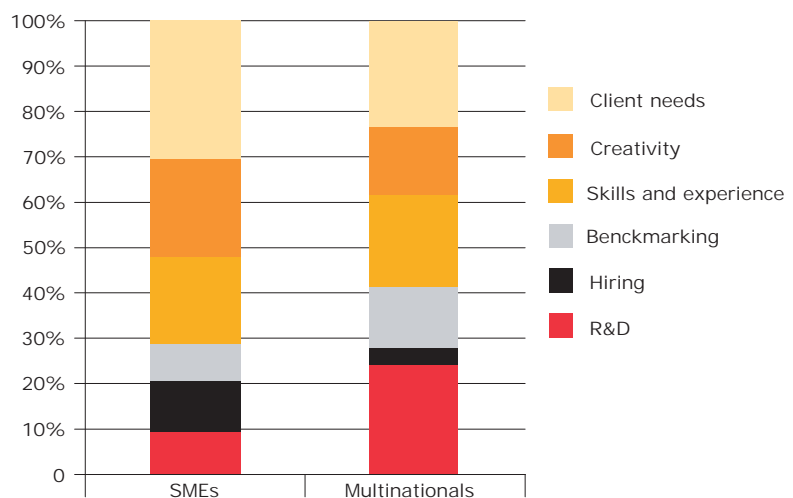


Illustration 12: Sources of innovation in a company according to its size.  
 Source: Drawn from conclusions within the Future Trends Forum.



Peter Drucker<sup>24</sup> 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.

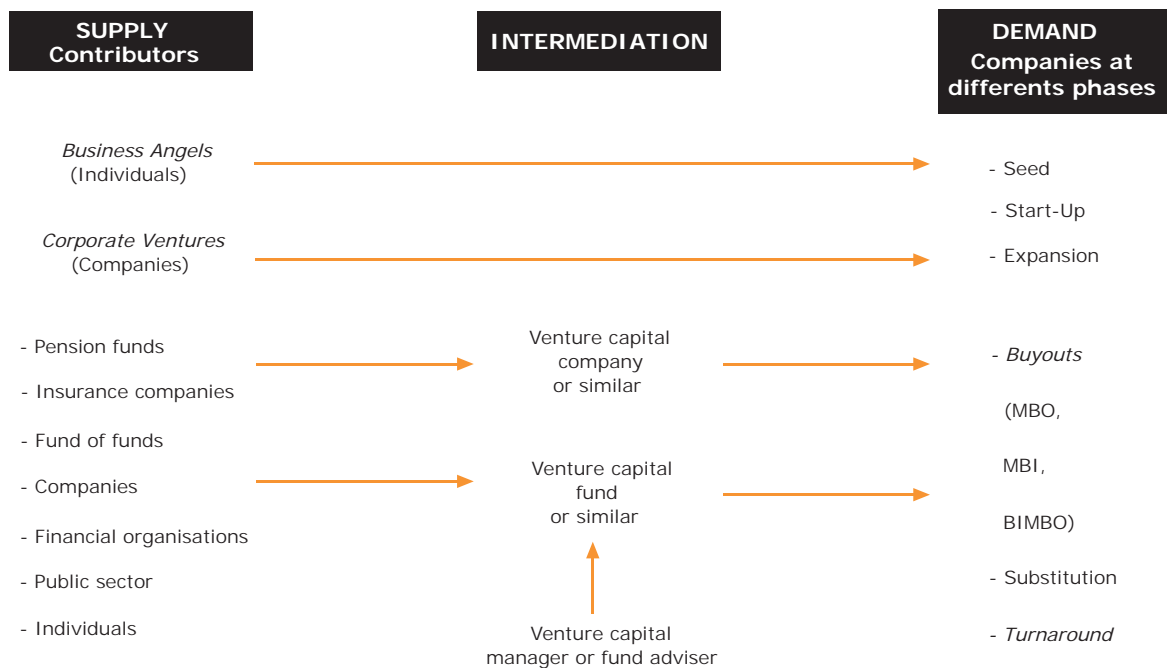


Illustration 13: Structure of venture capital market.  
 Source: José Martí Pellón. *Capital riesgo y capital desarrollo*. June 2005.

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<sup>25</sup> 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 created an index (see below), for measuring innovation in Europe by industry.

This analysis has been developed using 12 indicators<sup>26</sup> for a total of 25 industries in 15 European countries<sup>27</sup>.

| #  | 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 public subsidies to innovate                    | CIS 3  |
| 5  | Share of firms innovating in-house  | CIS 3  |
| 6  | Share of SMEs co-operating with other                                       | CIS 3  |
| 7  | Innovation expenditures 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.*

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.

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

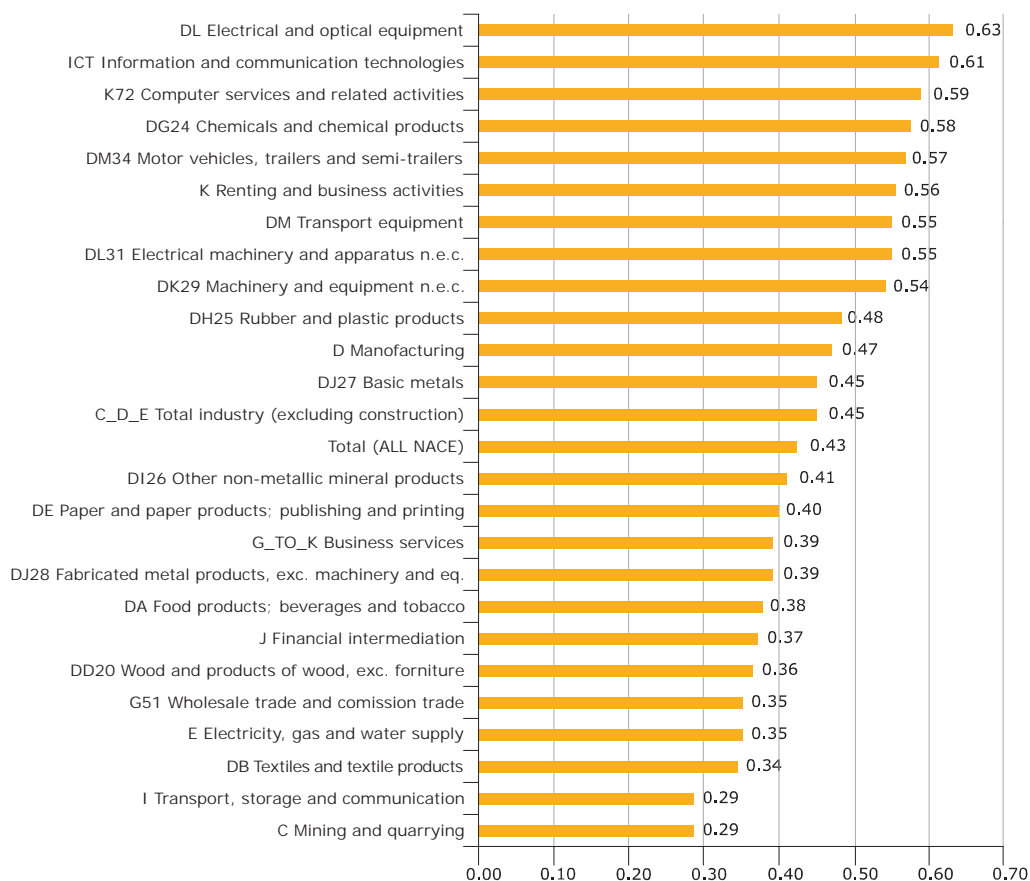


Illustration 14: Industry Innovation Scorecard: Europe.

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<sup>28</sup>.

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>.

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CHAPTER 4

# The FTF view on innovation

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## 4

## The FTF view on innovation



Having examined the dimensions of innovation and its impact on productivity and competitiveness, and conducted an analysis by regions, we now need to take this diagnosis further. With the help of the FTF experts, we will now propose measures that will help turn the weaknesses identified in the Spanish case into strengths and opportunities that will allow innovation to be turned into a strategic tool that will place the country among global leaders.

The experts' opinions have essentially been obtained from two sources:

- Two **working symposia** attended by all members of the forum. At the symposia, world experts gave a number of presentations. This was followed by an opinions phase, where each member had a chance to set out their vision, in groups and individually.
- These symposia were complemented with **questionnaires** to ascertain the joint opinion of the members of the forum on aspects that have the most influence in the area of innovation and on its importance on the world's economic panorama.

The results obtained, backed by an up-to-date bibliography, are set out in this chapter. The conclusions have been organised into the following sections: identification of weaknesses for Spain and proposed measures, efficiency in managing investment in RDI, legal framework and role of the public sector in innovation and recommendations in the business area for encouraging innovation, with particular emphasis on the types of innovation on which Spain should focus.

These conclusions are completed with a reflection by the experts on whether innovation is an option or a necessity for Spain.

#### 4.1. Identification of weaknesses and proposed measures

Having identified the factors that can influence innovation, the experts have diagnosed each one in the particular case of Spain. The results are shown in Illustration 15.

Notes

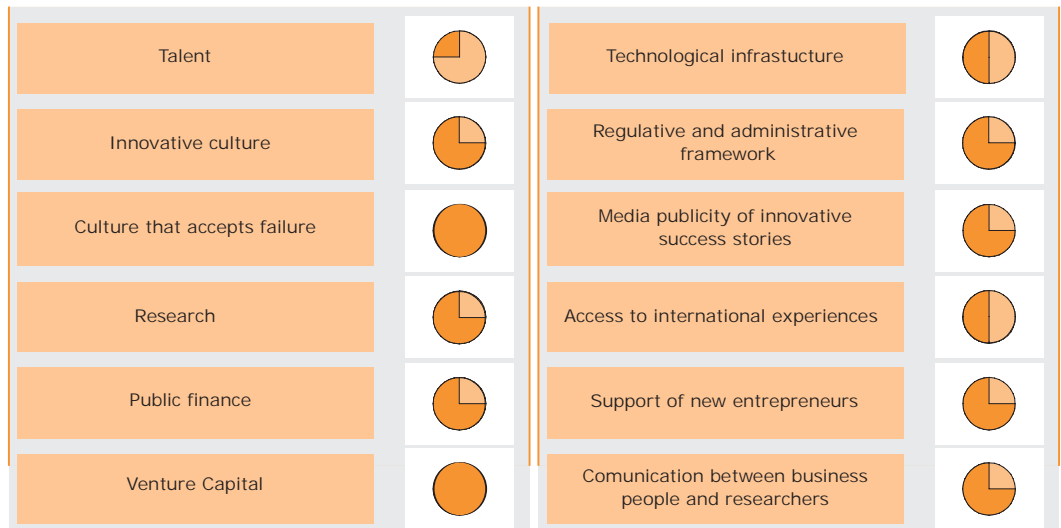


Illustration 15: Diagnosis of different factors influencing innovation in Spain.  
 Source: Drawn from conclusions within the Future Trends Forum.

This analysis shows that Spain has talent -the raw material exists- but the right legal and administrative framework has not been established to create an environment that will favour entrepreneurial and innovating processes. Combined with a lack of innovating culture and an aversion to risk and fear of failure, the result is that as a country, Spain has little capacity for innovation<sup>29</sup>.

As this publication has shown, in order to encourage and achieve suitable levels of innovation, there has to be a balance between all the various factors directly or indirectly involved.

### **Proposals related to innovating culture**

Given the current situation in Spain with a lack of **innovating culture**, the **Fundación de la Innovación Bankinter** wants to help transform society, making it less reluctant to accept risk and failure.

The experts were asked to suggest the measures they thought most suitable for encouraging such a culture. These measures, listed below, were very closely related to the other factors.

Any cultural change must come about through education; in this area, the following recommendations were made:

29. According to the 2006 Global Innovation Scoreboard produced by the European Trend Chart on Innovation, Spain ranks 27th in global innovation.



- Develop actions geared towards improving education and familiarising society with this concept. Innovation should be put on the curricula at all levels of education.
- Teach schools to innovate and to view failure as a learning experience.
- Explain in universities (where future innovators are educated) that being an entrepreneur and creating a company is a career option for graduates. This can be encouraged by the university through the creation of business incubators to support innovative market-oriented ideas.
- Encourage multidisciplinary research in the university and a greater inter-relation between university and industry.
- Insist on the importance of risk-taking in the business area at higher education levels.
- Introduce more practical and multidisciplinary syllabuses that promote research and experimentation, and give the universities greater autonomy, while at the same time demanding better results from them.
- Establish bridges between business schools and technical schools and include a greater level of business contents on the syllabuses of technical degree courses.
- Establish entities that will support graduates wanting to set up their own companies.
- Promote and professionalise technology transfer from universities and research centres to the private sector.

Most innovations are made by new companies; Encouraging **entrepreneurship** can therefore be an efficient way of promoting innovation. Here, the experts made the following recommendations:

- Develop actions geared towards encouraging people to try new things (create a company, participate in a start-up, train in new skills, etc.). The message should be: "The world is changing and host of new opportunities are opening up for you. The key concepts are observation, learning, hard work and risk-taking".
- Establish entities that will support graduates wanting to set up their own company.
- Open up the Spanish market through good technological infrastructures, tax incentives, etc. to successful international entrepreneurs with an interest in assuming risks, in order to encourage Spanish entrepreneurs to imitate them.

- Facilitate accessibility to public and private funding.
- Promote the figure of the business angel and technological incubators (addressed in greater detail in the previous chapter).

Other measures for encouraging an **innovative culture** in our society might include:

- Actions to **demystify the concept of "failure"** on two fronts: first, in the immediate setting (friends, family, society, etc.) and, secondly, among banks (or any credit institution), so that they recognise and value people who take risks. It is important to encourage an awareness of the possibilities for learning and acquiring extensive experience through failures.
- **Favour** the establishment of **alliances** and collaboration schemes with other entrepreneurs from countries with a more innovating tradition, in industries such as biotechnology and genetics, telecommunications, etc.
- **Facilitate agreements** by government with global institutions that will allow companies to be alert to opportunities that might arise beyond the immediate timescale.
- Design innovation competitions open to any individual or company on certain pre-selected themes.
- Promote **tax benefits** for marketing R&D activities.

Social and material **recognition** can be an effective tool for reinforcing and encouraging certain positive attitudes. Applied to the area of innovation, recognition of the best innovative projects and their promoters can arouse interest in innovation among other professionals or individuals in society. In this area the experts had the following recommendations to make:

- Give **media coverage** (in the press, articles in magazines and on television) to stories of business success and coverage for entrepreneurs who have been successful after initial failures. In the US, for example, some companies setting up in California actually prefer to hire people who have already been involved in a business failure, because of the experience they can draw from it.
- Set up national programmes of **awards and incentives** for the most innovative projects.
- Provide **social recognition** for stories of enterprise and successful innovators.



The purpose of all of these measures should be to create a culture of innovation in the society, company, etc. and no to impose templates for innovation. In general, people are more interested in something when they are given the tools to do it themselves than they have a particular way of doing it thrust upon them.

Independently of the measures proposed by each of the experts, they all agree that a change in culture is a long and complex process which must be tackled at all levels in society, beginning with education.

Some experts suggest that a more innovating and entrepreneurial culture in Spain might come as a result of immigration (which currently accounts for 10% of the population).

#### *Proposals in the area of venture capital*

Another of the factors on which the FTF experts believe Spain should focus to improve its level of innovation is **venture capital** (though some experts believe seed capital to be even more decisive). Their recommendations are as follows:

- Create a suitable framework (including, among other measures, the elimination of administrative barriers) that will favour the creation of technology companies to attract venture capital into Spain.
- Introduce tax incentives for venture capital funds and direct foreign investment setting up in Spain.
- Establish a "fund of funds"<sup>30</sup> to attract greater private investments in technology industries (such as biotechnology and IT).

Although the venture capital industry in Spain is still very small, the outlook are quite healthy, given that foreign investors view new hi-tech companies in Spain (in the biotech and IT industries, for example) as being a good destination for their investment. One initiative set up in Spain to attract new investment is NEOTEC Capital Riesgo, a programme launched by the CDTI in collaboration with the European Investment Fund, which agreed to invest in seed capital and start-ups jointly with two important European funds which had never previously invested in Spain.

Closely related to all these measures is the role of the government, which we will examine in greater detail later. The government is responsible for implementing the policies that are required to establish then right legal and administrative framework to encourage innovation.

30. In order to address the problem of a lack of private investment in Spain for technology companies (especially in the €0.1m - €2m bracket), a "fund of funds" has been created under the CENIT programme, coordinated by the CDTI.

## 4.2. Legal framework and role of the public sector

In a constantly changing universe, where, as Heraclitus of Ephesus (550-475 BC) put it, "change is the only constant", governments must be qualified to introduce laws, with a vision for the future, that are capable of keeping pace with rapid technological change. The values of anticipation and flexibility, then, are not confined to business strategies; they also need to be applied to the legal and administrative frameworks that govern the sphere of action (ecosystem).

The experts consulted by the FTF highlight the importance of creating an innovation-friendly ecosystem that will facilitate investment and dissemination.

Among of the crucial players in encouraging this ecosystem are the public authorities, because of the role they play in creating and managing a **favourable legal framework** for innovation, particularly one that will have a social and strategic impact for society. Governments must participate in creating this environment, and be willing to intervene as little as possible on the market and continuously to promote free competition.

In the specific case of Europe, governments need to play a more active role in encouraging innovation in order to create an effective and competitive European single market, where all the legal and fiscal barriers to innovative companies are eliminated.

Local protectionism which seeks to support less efficient players does not contribute to the long term creation of wealth. A particular effort needs to be made in encouraging innovation in less developed regions, investing in them until they develop a sustainable economy.

The creation of such an ecosystem requires the private sector to participate, to identify the areas of greatest innovation potential and those where greatest competitive advantage can be gained, and the for appropriate **tax reforms** to be oriented towards these areas.

In Spain, the government should lend its support to the country's existing competitive advantages, such as talent, natural resources and cultural advantages.

Throughout this book, we have seen that innovation must spring from society and we therefore need to allocate sufficient resources to creating a quality **education system** that will encourage entrepreneurship and a business spirit, risk-taking and a desire for innovation at all levels as a necessary value for society and the individual.

Aid to universities and development centres must concentrate on **encouraging research in universities** and eliminating barriers to competition.

The government needs to work with universities to promote innovation and improve collaboration between universities and industry.

Another important task which public authorities need to undertake is participation in business set-up funds and the commercialisation of innovative technologies coming from universities or from university-industry collaboration.

One important way of encouraging an innovative culture is to promote, through advertising, the first generations of successful entrepreneurs as role models, encouraging their social recognition as "heroes".

The **administrative and bureaucratic system must be simple and efficient**, reducing the prerequisites for opening a business and facilitating access to public and private funding. The trend must be for private investment to have the greatest weight, and it must therefore be provided with incentives through a reduction in taxes and rates, with tax deductions for individuals who invest in companies from high-risk industries with a capacity for innovation.

Tax policy must be oriented towards implementing specific tax laws that will allow greater **tax incentives** for hi-tech companies with the most capacity for innovation.

In order to finance the most innovative projects, **venture capital funds** need to be attracted using tax measures that minimise expenses resulting from losses or bankruptcy.

Given that research activities are an important aspect of innovation, appealing **tax incentives need to be established for investment in R&D**.

Government or regional programmes need to be developed for creating **incubators for start-ups with a high technological content**, which may be linked to universities. The private sector must be invited to take an active part in providing those with tax incentives for participating in risk. This is one way of contributing to an increase in investment, given that the private sector invests very little in developing innovation. It is also a good way of promoting less advanced regions and of enabling sustainable growth in all areas, thus avoiding excessive concentration.

Notes



### 4.3. Efficiency in managing R&D investment

In Chapter 3, we saw that R&D expenditure is one of the factors that influences innovation; according to the FTF experts, it is the main input for innovation in multinationals. Nonetheless, if this investment is to be translated into innovation and thus into an improvement in productivity and competitiveness, it must be effectively oriented and managed.

In order to ensure efficiency in managing RDI investment, our experts say, it needs as far as possible to be linked to private interests. Clearly there are improvements that need to be made in R&D in terms of the public good and the dissemination of information, but what is really prized at the end of the day is the monetary value on the market. We therefore need to keep sight of two goals: it is necessary to make investment in research, but it must be oriented towards market trends in order to achieve greater involvement of the private sector.

Investment must be targeted at sectors and industries which have a clear impact on productivity (the industrial sector), where Spain has a clear competitive advantage or on where there are pressing problems. Not all areas of innovation clearly meet these two requirements. We first need to identify which of them match these two characteristics. Mechanisms for controlling investment expenditure need to be established, especially when the funding comes from subsidies or is subject to tax incentives, to ensure that the ultimate aim of the investment is applied R&D, i.e. the application of the knowledge generated in research in a process, product or service.

To conclude, we can list some of the indicators the experts feel that can offer a vision of the efficiency of investment:

- Look at the way in which activity in direct foreign investment increases or decreases.
- Look at the relationship that exists between the number of researchers and the GDP in each region.
- Look at the increase or decrease in the number of engineers and scientists as a percentage of the population.
- See whether intellectual property activity has increased.

The relationship between R&D and innovation can be reinforced and the purpose of a good R&D investment policy must therefore be to create new opportunities in order to maintain economic growth and social wellbeing.

#### 4.4. In the business area

Companies are the launch pad of innovation and depend on innovation for their long term survival. We have already talked about the need for the companies to "recycle", that is, to innovate constantly and avoid getting stuck in the status quo, because no competitive advantage lasts for ever. Innovation must be present in all companies, regardless of the industry they belong to, and it is essential for this purpose for the leaders and professionals in these industries to understand the importance of innovation as a differentiated element with a huge impact on the competitiveness of their organisation.

In this chapter we are going to pay special attention to Spain and we will see how it is possible, according to the FTF experts, to encourage innovation within the company, which is the role of the leaders in this field and what types of innovation Spanish companies need to focus on.

##### 4.4.1. Encouraging innovation within the company

As we have seen, using a diagnosis of innovation in Spain, the FTF experts have identified a series of weaknesses which must be addressed in order to achieve better levels of innovation and thus higher productivity and competitiveness in our companies.

One of the aspects most undervalued has been an innovative culture, when this is actually one of the most important factors in the world's most innovative countries, such as the US and Israel.

##### *Innovative culture*

One of the keys to encouraging innovation is the existence of an "innovating and entrepreneurial culture" within the company and at all levels of the organisation, given that innovation is a multidisciplinary team work.

In order to create an innovating culture within an organisation, one essential factor that needs to be taken into account is human capital. Consequently, if an innovating culture is to be encouraged in the organisation, the first thing that needs to be done is to involve all members of the organisation, whatever their functions or their level of responsibility.

The first step in achieving this is to create, within the organisation, an **infrastructure** that will enable management to be receptive to suggestions from employees. Support for innovation must start from the top and be visible to everyone. Promoting **multidisciplinary work and team work**, in other words, interaction between employees so that they exchange ideas, is another important factor in creating an environment that will foster creativity, problem-solving and the conception of original ideas that can lead to new innovations.

In order for ideas to flow, it is necessary to promote active participation and collaboration among all employees. One way of doing this is to **reward the most innovative ones for their participation and contribution** with prizes and incentive schemes (not just with money: the FTF experts argue that innovation is more sensitive to **social recognition** than to cash prizes). The idea must be to create a culture that recognises and values good ideas. Similarly, it is important to reward not only participation, but also initiative and risk.

Once all the ideas have been compiled, they need to be studied and those which, a priori, should be taken into consideration need to be identified. The next step in the innovation process is to **channel creative contributions** in order to turn them into useful ideas.

Indeed, professionals must be capable of discovering opportunities for improvement with a view to seeking efficiency and the creation of sustainable competitive advantages. This requires, on the one hand, a broad knowledge of the market and the needs of consumers and customers, a key factor in orienting innovation towards the creation of wealth through new products and services or through an improvement in existing ones, and, at the same time, the capacity to move quickly from idea to production. It is therefore essential **to invest in the customer's knowledge and to create an organisational framework that will make it easy to adopt innovative policies.**

The FTF experts also mention the importance of other factors in creating an innovating culture in the company, including searching out and developing talent and, of course, the essential role of company leaders.

#### **4.4.2. Skills of an innovation leader**

There are opposing views on the need for companies to have a chief innovation officer.

Some believe that such a figure would only create more red tape in the company and shackle the flow of ideas at all levels of the organisation and even from the outside. They feel that innovation should be a process that affects all areas of the organisation, and should not be limited to one particular department of innovation.

Others see the CIO as being important as an innovation developer, who works with all company managers to create an innovation-friendly culture and climate. In addition, the CIO should always be alert to the market, looking for trends and technologies that the organisation could take on board to create more wealth. Likewise, the CIO would establish processes for innovation.



Some companies have already decided to create the post of the CIO, who is in charge of **encouraging and managing innovation within the organisation**. The initiative clearly demonstrates that these companies are making a determined commitment to innovation, and that they have understood its importance within the company. However, the FTF experts believe responsibility for innovation cannot be delegated to a single person, but instead has to be distributed amongst all management levels of the company.

Given that the post of the CIO is one that has arisen in the last five years (though this varies by region) and despite the fact that some companies have already taken the step towards creating it, many others are still wondering what characteristics a good innovation manager should have and what role he or she should play in the organisation.

First of all, this figure must have a **broad knowledge**, both of the company and of the industry in which it operates (competitors, customers, technologies, products, etc.) and of the market in general, as well as **diversified and multidisciplinary experience**. He or she must know how to compile, identify and exploit the ideas that will allow the company to develop new or improved businesses, anticipate customers' needs and establish bridges between these and the business, through the **technological possibilities** that exist inside or outside the organisation.

They must be **leaders** and by this we are not referring to their position in the hierarchy, but to the fact that they should have the skills to manage work teams, with a vision for the future, great credibility and a capacity to unite the efforts of an entire team, with a high level of dedication and enthusiasm, to achieve certain common objectives.

Another of the key skills is a capacity to **attract the best innovating talents** on the market. Recognising existing talent in different areas of the company and favouring communication between complementary ideas encourages creativity and innovation of the professionals at any level.

As the concept of innovation itself implies, the CIO must be a **creative** person, **approachable, open to new ideas, unafraid of change** and eager to **take on new challenges**.

He or she must also be a **good communicator**, capable of "selling" and institutionalising the concept of innovation, as well as its importance within the organisation, so that it is interiorised at all levels and not restricted to an innovation department; if this were to happen, the possibilities of failure of any project of this kind would probably be quite high.

It is also essential that such individuals should have the skills to **manage innovation projects**, which-as we have seen-are characterised by greater uncertainty and risk, medium and long term targets, shared resources, etc.

Notes

### 4.4.3. Types of innovation with greatest added value for Spain

According to the FTF experts and returning to Doblin's types of innovation<sup>31</sup>, Spanish companies should focus on innovations in the **brand, business model, service** and **customer experience**, since these are the ones where the country can hope to be the most successful.

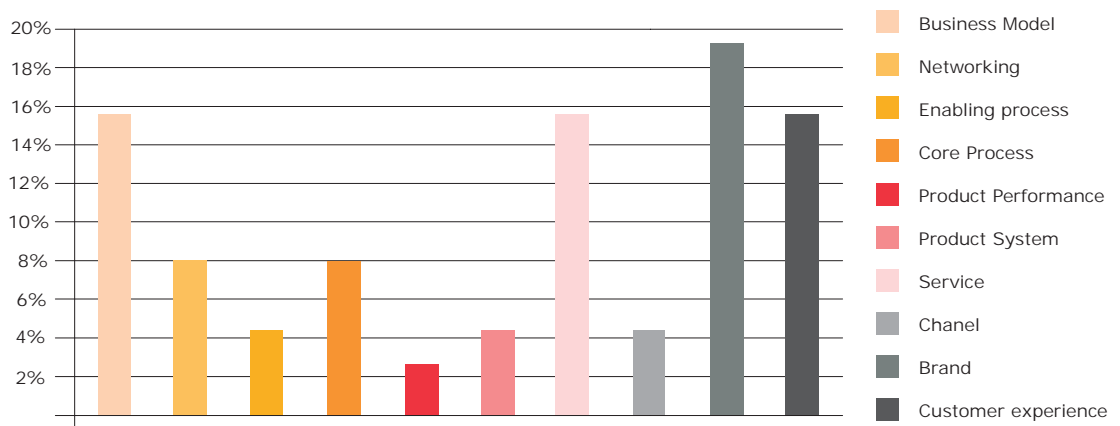


Illustration 16: Types of innovation with greatest added value for Spain.  
 Source: Drawn from conclusions within the Future Trends Forum.

Innovation has to affect different phases of development, the first of which is product innovation, before focusing on other types of innovation.

Spain should not stop investing in product innovation, but should exploit this capacity more in other areas. First of all, we need to find strengths and make a commitment to them.

The FTF experts consider that **brand** is the first type of innovation Spain should focus on, since it could represent a fast way of disseminating successful products at a national and international level. Although Spain is a world leader in a number of sectors and industries (such as the auto and tourism industries), it lacks international visibility.

It needs to invest in its brand and work with internationally registered brands in industries such as construction, real estate, financial services, tourism, energy, health, transport and others.

In terms of the **business model**, another type of innovation FTF experts consider most suited to Spain, companies such as Zara are an example of Spanish creativity in businesses, and the power of design and branding, demonstrating that innovation is related not only to technology, but also to the introduction of new

31. Doblin:  
<http://www.doblin.com/IdeasIndexFlashFS.htm>.



business models and processes, and that it can be found in any industry. Other highly successful business models could be developed by Spanish companies if they focus on innovative efforts in that area of the innovation "map".

This applies not only to large companies. Thanks to globalisation and advances in technology (telecommunications, IT, etc.), SMEs also have the chance to develop business models that will enable them to build a win-win relationship with local players in developing and developed economies.

According to the FTF experts, **services** could be one of the Spanish economy's strengths in the future. Due to its lack of entrepreneurs, Spain probably has more successful opportunities in this area of innovation. Moreover, Spain is mainly a services economy and the proposal of a "complete service" from companies of products and services (covering construction, project financing, facilities management, etc.) is one of the factors of their success.

The most valuable innovation is the one that can't easily be copied. In this sense, **customer's experience** is governed by very local factors and, as a result, it is probably the innovation that creates most value. Spain has the advantage of customer experience, thanks to its climate, its music, etc. This experience must be its primary objective, a suggestion which is backed by the experience and successes achieved in the restaurant, architecture, hotel and other industries.

#### **4.4.4. What industries should investment focus on in Spain?**

By fostering the industries in which Spain is most competitive we can contribute to creating the ecosystem we have referred to elsewhere in this book. In this way, by internally selling successful cases and encouraging an innovative and entrepreneurial culture, we can improve current rates of competitiveness and innovation.

Illustration 17 shows the industries in which the experts believe there is the most potential for business innovation in Spain and, therefore, the ones which investment to increase innovation rates and thus competitiveness should focus on.

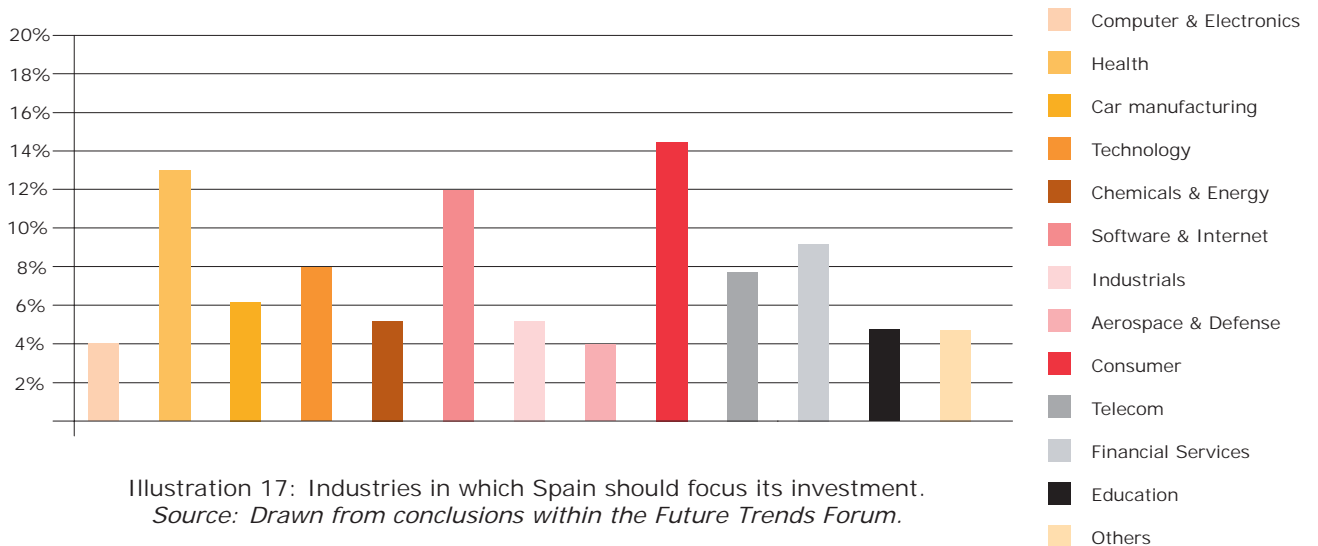


Illustration 17: Industries in which Spain should focus its investment.  
 Source: Drawn from conclusions within the Future Trends Forum.

As this illustration shows, the industries in which the experts feel we should concentrate our efforts in order to obtain competitive advantages are the consumer goods industry, the health industry, and software and the Internet, without ignoring others such as financial services and telecommunications.

The combination of cost, talent and a favourable climate gives Spain an opportunity in the health industry. Another important field which should be stressed more by investment is software and the Internet, because of its low initial cost and the creativity it requires, aspects which the experts feel Spanish culture is strong in. The Spanish financial system also deserves special mention. Here, some Spanish institutions are positioning themselves as the most competitive in the world with a sophisticated and complex system.

As well as the industries listed in Illustration 17, others with particular relevance for Spain include architecture, hotels and tourism.

In the area of leisure and construction of infrastructures, Spain has competitive clusters which could act as suitable areas for investing our limited resources, instead of trying to generate innovation in industries where we do not initially possess competitive advantages.

To make this sector analysis, we should not forget the globalisation context, and should avoid focusing exclusively on domestic markets and should extend our study to the possibilities of opening up towards new markets, such as perhaps the Asian market (currently in expansion).

Using this approach, the experts say that Spain must also increase its international visibility, through the sale and reinforcement of the "Spain" brand, to position itself as an innovating country with quality products, such as Zara and Mango, two world famous examples from the textile industry, or Ferrán Adriá, with his innovations in the catering industry.

In short, it is not a question of concentrating investment in the most innovative industries; rather, each country has to know its strengths and the industries in which it can be most competitive, and focus its efforts on those areas. There are companies with very good results generating wealth and employment in sectors generally considered to be less innovative. The challenge, in these cases, will be to encourage innovation in these industries.

#### 4.5. Innovation: option or necessity?

In conclusion, the rapid development of markets and globalisation mean that innovation has ceased to be an option and **is now a necessity**. The company of the future must necessarily be an innovative company constantly developing in the search for new competitive advantages, promoted by a growing competition and continuous sophistication of demand.

The future is for those that are capable of innovating and which have the capacity to create and apply knowledge. Companies need to obtain competitive advantages through differentiation, and innovation is what makes it possible to differentiate products and services from the competition.

On this basis, the FTF experts believe that in the case of Spain, innovation is clearly also a **necessity**...

#### Notes

- ...from the moment in which the country's **competitiveness** continues to decline and **globalisation** puts increasing pressure on companies to make improvements in terms of competitiveness;
- ...from the moment in which **customers become increasingly demanding** and competition is constantly increasing. It is necessary to innovate in order to prevent losing or even to increase the market share;
- ...from the moment in which the **lifespan of a product becomes ever shorter** and yet costs continue to climb. Things that used to work on the market no longer do. In other words, an improvement in profits can only come from the creation of value through a catalogue of products and services;
- ...unless Spain wants to find itself relegated to the third group of countries whose main assets are labour, on which terms it could not compete;

■ ...from the moment in which some competitors, especially emerging economies, start focusing on imitation, thus bringing about a **drop in prices and trading margins**. Therefore, if the company does not offer something differential, the sustainability of the business project is in danger.

In conclusion, not properly taking on board the challenge of innovation would mean condemning the company to stagnation or even decline. There is no place for the status quo. Innovate or die; the process needs to involve not only the business sector, but society as a whole, since it involves an improvement in the social and economic conditions of the population at large.



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# Appendix

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# Indicators in the 'European Innovation Scoreboard' (EIS)

The *European Innovation Scoreboard* (EIS) is an instrument devised by the European Commission under the Lisbon Strategy to assess and compare the innovation performance of EU member states.

The 26 indicators used in the EIS, grouped into five categories, are summarised below:

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

| #   | EIS 2005 Indicators   | Numerator   | Denominator  |
|-----|---|---|--|
| 1.1 | New S&E graduates per 1000 population aged 20-29.   | Number of S&E (science and engineering) graduates. S&E graduates are defined as all post-secondary education graduates (ISCED classes 5a and above) in life sciences (ISC42), physical sciences (ISC44), mathematics and statistics (ISC45), computing (ISC48), engineering and engineering trades (ISC52), manufacturing and processing (ISC54) and architecture and building (ISC58).   | The reference population is all age classes between 20 and 29 years inclusive. |
| 1.2 | Population with tertiary education per 100 population aged 25-64.                                 | Number of persons in age class with some form of post-secondary education (ISCED 5 and 6).  | The reference population is all age classes between 25 and 64 years inclusive. |
| 1.3 | Broadband penetration rate (number of broadband lines per 100 population).                        | Number of broadband lines. Broadband lines are defined as those with a capacity equal to or higher than 144Kbit/s.  | Total population as defined in the European System of Accounts (ESA 1995).     |
| 1.4 | Participation in lifelong learning per 100 population aged 25-64.                                 | Number of persons involved in life-long learning. Life-long learning is defined as participation in any type of education or training course during the four weeks prior to the survey. Education includes both courses of relevance to the respondent's employment and general interest courses, such as in languages or arts. It includes initial education, further education, continuing or further training, training within the company, apprenticeship, on-the-job training, seminars, distance learning, and evening classes. | The reference population is all age classes between 25 and 64 years inclusive. |
| 1.5 | Youth education attainment level (% of population aged 20-24 having completed at least upper sec. | Number of persons aged 20-24 having completed at least upper secondary education, i.e. with an education level ISCED 3-4 minimum.   | The reference population is all age classes between 20 and 24 years inclusive. |

Table 4: Innovation drivers.

Source: *European Innovation Progress Report 2006*. Trendchart.

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

| #   | EIS 2005 Indicators  | Numerator  | Denominator  |
|-----|--|--|--|
| 2.1 | Public R&D expenditures (% of GDP).  | Difference between GERD (Gross domestic expenditure on R&D) and BERD (Business enterprise expenditure on R&D). Both GERD and BERD according to Frascati-manual definitions, in national currency and current prices.   | Gross domestic product as defined in the European System of Accounts (ESA1995), in national currency and current prices. |
| 2.2 | Business R&D expenditures (% of GDP).  | All R&D expenditures in the business sector (BERD), according to Frascati-manual definitions, in national currency and current prices.   | Gross domestic product as defined in the European System of Accounts (ESA1995), in national currency and current prices. |
| 2.3 | Share of medium-high-tech and high-tech R&D (% of manufacturing R&D expenditures). | R&D expenditures in medium-high and high-tech manufacturing in national currency and current prices. These include chemicals (NACE24), machinery (NACE29), office equipment (NACE30), electrical equipment (NACE31), telecommunications and related equipment (NACE32), precision instruments (NACE33), automobiles (NACE34) and aerospace and other transport (NACE35). | R&D expenditures in total manufacturing, in national currency and current prices.  |
| 2.4 | Share of enterprises receiving public funding for innovation.                      | Number of innovative enterprises that have received public funding. Public funding includes financial support in terms of grants and loans, including a subsidy element, and loan guarantees. Ordinary payments for orders of public customers are not included. (Community Innovation Survey).  | Total number of enterprises, thus both innovating and non-innovating enterprises. (Community Innovation Survey).         |
| 2.5 | University R&D expenditures financed by business sector.                           | R&D expenditure in the higher education sector financed by business, in national currency and current prices.  | Total R&D expenditures in the higher education sector (HERD), in national currency and current prices.                   |

Table 5: Knowledge creation.

Source: *European Innovation Progress Report 2006. Trendchart.*



**3. Innovation & entrepreneurship** (six indicators): measure efforts towards innovation at company level.

| #   | EIS 2005 Indicators                                  | Numerator   | Denominator   |
|-----|--|---|---|
| 3.1 | SMEs innovating in-house (% of SMEs).                | Sum of SMEs with in-house innovation activities. Innovative firms are defined as those who introduced new products or processes either 1) in-house or 2) in combination with other firms. This indicator does not include new products or process developed by other firms. (Community Innovation Survey).  | Total number of SMEs. (Community Innovation Survey).  |
| 3.2 | Innovative SMEs cooperating with others (% of SMEs). | Sum of SMEs with innovation co-operation activities. Firms with co-operation activities are those that had any co-operation agreements on innovation activities with other enterprises or institution in three years of the survey period. (Community Innovation Survey).   | Total number of SMEs. (Community Innovation Survey).  |
| 3.3 | Innovation expenditures (% of turnover).             | Sum of total innovation expenditure for enterprises, in national currency and current prices. Innovation expenditures includes the full range of innovation activities: in-house R&D, extramural R&D, machinery and equipment linked to product and process innovation, spending to acquire patents and licences, industrial design, training and the marketing of innovations. (Community Innovation Survey).  | Total turnover for all enterprises, in national currency and current prices. (Community Innovation Survey).               |
| 3.4 | Early-stage venture capital (% of GDP).              | Venture capital investment is defined as private equity raised for investment in companies. Management buyouts, management buyins, and venture purchase of quoted shares are excluded. Early-stage capital includes seed and start-up capital. Seed is defined as financing provided to research assess and develop an initial concept before a business has reached the start-up phase. Start-up is defined as financing provided for product development and initial marketing, manufacturing and sales. Companies may be in process of being set up or may have been in business for a short time, but have not yet sold their product commercially. | Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices. |
| 3.5 | ICT expenditures (% of GDP).                         | Total expenditures on information technology (ICT), in national currency and current prices. ICT includes office machines, data processing equipment, data communication equipment, and telecommunications equipment, plus related software and telecom services.   | Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices. |

| #   | EIS 2005 Indicators                              | Numerator   | Denominator  |
|-----|--|---|--|
| 3.6 | SMEs using non-technological change (% of SMEs). | CIS question 12.1 asks firms if, between 1998 and 2000, they implemented "advanced management techniques", "new or significantly changed organizational structures", or "significant changes in the aesthetic appearance or design in at least one product". A "yes" response to at least one of these categories would identify a SME using non-technical change. (Community Innovation Survey). | Total number of SMEs. (Community Innovation Survey). |

Table 6: Innovation & entrepreneurship  
Source: *European Innovation Progress Report 2006. Trendchart.*

**4. Applications** (five indicators): measure the performance, expressed in terms of labour and business activities, and their value added in innovative sectors.

| #   | CII Indicators 2005  | Numerator   | Denominator  |
|-----|--|---|--|
| 4.1 | Employment in high-tech services (% of total workforce).         | Number of persons employed in the high-tech services sectors. These include post and telecommunications (NACE64), information technology including software development (NACE72) and R&D services (NACE73).   | The total workforce includes all manufacturing and service sectors.  |
| 4.2 | Exports of high technology products as a share of total exports. | Value of high-tech exports, in national currency and current prices. High-tech exports include exports of the following products: aerospace; computers and office machinery; electronics-telecommunications; pharmaceuticals; scientific instruments; electrical machinery; chemistry; non-electrical machinery and armament (cf. <i>OECD STI Working Paper 1997/2 for the SITC Revision 3 codes</i> ). | Value of total exports, in national currency and current prices.   |
| 4.3 | Sales of new-to-market products (% of turnover).                 | Sum of total turnover of new or significantly improved products for all enterprises. ( <i>Community Innovation Survey</i> ).  | Total turnover for all enterprises, in national currency and current prices. ( <i>Community Innovation Survey</i> ). |

| #   | CII Indicators 2005   | Numerator  | Denominator  |
|-----|---|--|--|
| 4.4 | Sales of new-to-firm not new-to-market products (% of turnover).              | Sum of total turnover of new or significantly improved products to the firm but not to the market for all enterprises. ( <i>Community Innovation Survey</i> ).   | Total turnover for all enterprises, in national currency and current prices. ( <i>Community Innovation Survey</i> ). |
| 4.5 | Employment in medium-high and high-tech manufacturing (% of total workforce). | Number of employed persons in the medium-high and high-tech manufacturing sectors. These include chemicals (NACE24), machinery (NACE29), office equipment (NACE30), electrical equipment (NACE31), telecommunications and related equipment (NACE32), precision instruments (NACE33), automobiles (NACE34) and aerospace and other transport (NACE35). | The total workforce includes all manufacturing and service sectors.  |

Table 7: Application.

Source: *European Innovation Progress Report 2006. Trendchart.*

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

| #   | CII Indicators 2005  | Numerator  | Denominator  |
|-----|--|--|--|
| 5.1 | European Patent Office (EPO) patents per million population.           | Number of patents applied for at the European Patent Office (EPO), by year of filing. The national distribution of the patent applications is assigned according to the address of the inventor.                 | Total population as defined in the European System of Accounts (ESA 1995). |
| 5.2 | US Patent and Trademark Office (USPTO) patents per million population. | Number of patents granted by the USPTO, by year of grant. Patents are allocated to the country of the inventor (using fractional counting in the case of multiple inventor countries).                           | Total population as defined in the European System of Accounts (ESA 1995). |
| 5.3 | Triadic patent families per million population.                        | Number of triad patents. A patent is a triad patent if and only if it is filed at the European Patent Office (EPO), the Japanese Patent Office (JPO) and is granted by the US Patent & Trademark Office (USPTO). | Total population as defined in the European System of Accounts (ESA 1995). |

| #   | CII Indicators 2005  | Numerator   | Denominator  |
|-----|--|---|--|
| 5.4 | Number of new community trademarks per million population.         | Number of new community trademarks. A trademark is a distinctive sign, which identifies certain goods or services as those produced or provided by a specific person or enterprise. The Community trademark offers the advantage of uniform protection in all countries of the European Union on the strength of a single registration procedure with the Office for Harmonization. | Total population as defined in the European System of Accounts (ESA 1995). |
| 5.5 | Number of new community industrial designs per million population. | Number of new community designs. A registered community design is an exclusive right for the outward appearance of a product or part of it, resulting from the following features: the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation.  | Total population as defined in the European System of Accounts (ESA 1995). |

Tabla 8: Intellectual property  
Source: *European Innovation Progress Report 2006. Trendchart.*

# Glossary

## A

**Applied research:** research work with a specific practical purpose.

**Asian Tigers:** term used to refer to Hong Kong, Taiwan, Singapore and South Korea. The term refers to the great strength and competitiveness these countries have achieved in the world economy.

## B

**Basic research:** research work for the purpose of obtaining scientific knowledge that is not oriented towards a practical specific goal or application. Usually performed in universities or research centres.

**Biotechnology:** scientific study of the methods and applications of the use of living cells for obtaining and improving useful products, such as food and drugs.

**Business angels:** individuals with investment capacity who give backing for the early stages of business projects with high growth potential, providing capital, know-how and experience.

**Business culture:** character, viewed as a set of beliefs, values and vision of the business environment shared by the majority, and style, viewed as performance, design, guidelines for action, practices, etc., of a company.

**Business incubators:** project or company whose aim is the creation and/or development of small companies and their support during the early stages.

## C

**CDTI (Centro para el Desarrollo Tecnológico Industrial [Centre for Industrial Technological Development]):** public business body, answerable to the Ministry of Industry, Tourism and Commerce, which promotes innovation and technological development in Spanish companies. Its aim is to contribute to improving the technological level of Spanish companies.

**Cluster:** geographic concentration of interconnected companies, specialist suppliers, service providers, com-

panies from associated industries and connected institutions (e.g. universities, regulation agencies and associations from the industry), in specific fields, which are in competition but also co-operate.

**Competitive advantage:** favourable condition obtained by companies when they perform activities more efficiently than their competitors (lower costs) or by doing them differently, allowing them to create greater value for buyers and to obtain profits.

**Competitive opportunity:** possibility of gaining an advantageous position over the competition. Competitive opportunity is created by the management process that explores a given technology, not by the technology per se (INTL glossary, 2001).

**Competitiveness:** set of factors that explain the capacity of a country or company to produce goods and services efficiently, with international standards of technology and quality, and consequently to attain high levels of productivity and earnings.

**Corporate strategy:** set of decisions and actions which, following adaptation of the existing resources to forecast trends in the business environment, are intended to achieve certain medium or long-term aims.

## D

**Direct foreign investment (DFI):** investment in which the management control of an organisation residing in one economy is held by a company residing in another.

**Differentiation of product or service:** differentiation means that a company possesses a defined characteristic that is relevant for customers and makes a product or service unique in its category. Differentiation must be difficult to imitate, equal or surpass since otherwise it will be nullified.

**Dissemination:** action of publicising the utility of an innovation. Consists of introducing the innovation on the market in such a way that it is disseminated throughout the business world and generates technological change and progress. This is the moment at which a country really receives the benefits of the innovation.

## E

**EMU:** Economic and Monetary Union.

**EU:** European Union.

**EU-15:** the fifteen European Union member states between 1995 and 2004.

**EU-25:** the twenty-five European Union member states from May 2004 to January 2007.

## F

**FORINTEL:** this initiative targets permanent adaptation and development among workers and job contents, and at the same time works to improve the competences and qualifications of telecommunications and IT companies and their personnel and the industries that use them. It is promoted by the Ministry of Science and Technology and framed within the European Social Fund's business initiative and lifelong learning programme.

**FP4, FP5, FP6, FP7:** European Union Framework Programmes of support to research and technological development.

**Future Trends Forum (FTF):** forum for participation and study created by the Fundación de la Innovación Bankinter to promote the study and dissemination of new trends at a global scale in technical, social and economic areas.

## G

**GDP:** Gross Domestic Product.

**GERD:** Gross domestic expenditure on R&D.

**Globalisation:** process whereby the growing communication and interdependence between the world's different countries is leading to a unification of markets, societies and cultures, through a series of social, economic and political transformations which give them a global character.

**GNP:** Gross National Product.

## H

**Human Capital:** the area of intellectual capital that includes both present competences (knowledge, skills and attitudes) and the capacity for learning and creativity of the persons and work teams that form the organisation. The company cannot own the human capital (adapted from L.A. Rivas Tovar, 2002).

## I

**ICT:** information and communication technology.

**Industry:** group of companies or businesses contained within a differentiated area of economic and manufacturing activity.

**INE:** Instituto Nacional de Estadística [Spanish National Statistics Institute].

**Information Society:** state of social development characterised by the capacity of its members (citizens, companies and public administration) to obtain and share any information immediately from anywhere.

**Innovation and technology offer:** organisations that generate and disseminate technology used by the different agents in the innovation system. It essentially comprises universities and technology and industry centres.

**Innovation strategy:** does not involve a single strategy intended to apply simple changes or to embellish previous offers; rather it is a strategy that seeks to introduce large unique innovations (S.P. Robbins, 1993).

**Intellectual Capital:** Set of intangible resources and capacities of a strategic nature possessed or controlled by an organisation. Encompasses a set of immaterial, invisible or intangible assets, not included on balance sheets, which allow the company to operate, creating value for it (adapted from L.A. Rivas Tovar, 2002).

**Internationalisation:** action whereby territories or issues that previously depended on the authority of a single state submit to the joint authority of various nations or a representative body thereof. (definition given by the Real Academia Española).

**Invention:** creation of an idea that can potentially generate commercial benefits, but not necessarily taking a specific form in products, processes or services.

## K

**Know-how:** The skills and knowledge of a company, research institution, etc.

## L

**Life-long learning:** tool used by companies and workers to update their knowledge and improve their competitiveness and capacity for adaptation, with the ultimate purpose of successfully meeting technological and management challenges.

**Lisbon Strategy:** commitment reached in 2000 by the European Council to make the European economy the most dynamic and competitive economy in the world in ten years.

**LIUP:** Government of Singapore's Local Industry Upgrading Programme intended to create a network of knowledge-based companies.

## M

**Multinational:** a company which operates in a large number of countries with the aim of maximising its profits in a global group perspective rather than in each of its independent national units. Involves adapting to the local needs of the countries where it offers its products, and therefore contains a low degree of standardisation.

## N

**New Economy:** an economy in which information technology and other related investments generate high growth rates in productivity. Some authors trace the con-

cept back to 1995 when Netscape started trading on the stock market launch.

**NUS:** National University of Singapore.

## O

**OECD:** Organisation for Economic Cooperation and Development. An international organisation made up of 30 developed countries whose aim is to coordinate their economic and social policies. It was founded in 1961 and has its headquarters in Paris.

**Organic structure:** flexible, decentralised strategy, in which jobs are defined in a generic and adaptable way, and there is relatively little formalism. It is the best structural option for an innovation strategy. Coordination and access to information is facilitated by IT (S.P. Robbins, 1993).

## P

**Process:** Hammer and Champy define this as a set of activities that receives one or more inputs and creates a product of value for the customer. Various tasks may be involved in each process.

**Productivity:** capacity for improving production processes not only in terms of volume, but also in terms of efficiency in the use of the supplies and saving.

## R

**R&D:** research and development.

**RDI:** research, development and innovation.

**RTD:** research and technological development.

## S

**Setting:** (or environment) set of social, cultural, political, legal and economic conditions that influence the life of an individual or organisation. For the company it is everything that is external to them.

**SMEs:** small and medium-sized enterprises employing less than 250 people with a volume of business or general annual balance of less than 40 and 27 million euro, respectively.

**Spin-off:** Companies created within existing organisations. These may consist of a new company, university or government agency, which act as incubators.

**Strategic level:** also known as top management. This is the highest tier in any organisation's pyramid. It is the hard core of the company and comprises the executives who are in charge of drawing up the company's strategy guidelines and deciding what the company has to do. They are ultimately responsible for implementing business reengineering processes and ensuring that all staff are involved in the project.

**Strategic planning:** administrative process of reconciling an organisation's resources with its market opportunities (Michael Porter).

## T

**Technological innovation:** Innovation resulting from primary application of scientific and technical knowledge in solving the problems that arise in the different manufacturing industries, and which leads to a change in the products, services or, in general, in the company itself through the introduction of new products, processes or services based on new technologies.

**Technological revolution:** term used to highlight the number of changes that technology has brought about in society, which taken together represent a real revolution.

**Technology:** Knowledge and information pertaining to an activity which can be used systematically for designing, developing, manufacturing and marketing products or for providing services, which includes suitable application of techniques associated with overall management.

**Technology management:** tool which forms part of the general processes of innovation to which all companies are subject. Increasingly, control over the technological resource gives organisations a competitive edge, espe-

cially where it is integrated into the organisation's general strategy.

**Technology transfer:** transmission and assimilation of know-how from one country or market to another or from a research centre to a company, resulting in innovation.

## U

**UNESCO:** United Nations Educational, Scientific and Cultural Organization.

## W

**World Economic Forum:** private foundation created in 1971 which brings together the leading European economic leaders at a meeting in Davos (Switzerland). Since 1991 it has become a summit meeting for the most powerful political and business leaders in the world and one of the main strategic centres of globalisation. Its head offices are in Geneva and it is supervised by the Swiss government.



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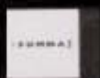
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### Diseño y Maquetación

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**arroba**  
network