VIII Symposium Cotec Europa

Madrid, October 03rd, 2012

Working Document

VIII Encuentro Cotec Europa

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SMES growth to improve innovation abilities

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The corporate universes of Spain, Italy and Portugal: an over-representation of micro and small enterprises

Southern European countries are known for the predominance, in their production fabric, of small and medium enterprises. Some numbers are quite clarifying.

If one considers only the micro enterprises (employing 1 to 9 workers), they will absorb, according to the most recent information available, 38% of employment in Spain, 41% of employment in Portugal and 46% of employment in Italy. The percentage is even higher in Greece (58% of employment), being in all cases way above of what is usually considered for well-succeeded economies, such as Japan (8% of employment) and United States (11% of employment). Within the European Union, in the best performing economy, Germany, employment in micro enterprises does not exceed an overall value of 20%.

Such comparison does not improve if small enterprises (employing 10 to 49 workers) are added to micro enterprises, being in fact worse. Overall, these two groups of companies absorb 62% of employment in Spain, 64% of employment in Portugal and 69% of employment in Italy. This percentage is even higher in Greece, where it reaches 76%, a value much higher than that of the Unites States (18%) and Japan (19%), now in inverted positions but still very close. In Germany, employment in micro and small enterprises does not exceed 30% overall.

This means that in Spain, Italy and Portugal, the area occupied by medium and large enterprises is quite small. In Spain, they represent no more than 38% of employment, a percentage that decreases in Portugal and Italy to 36% and 31% respectively. In Greece, it represents 24%, increasing in Japan to 66%, in the Unites States to 67%, and in Germany to 60% (with 20% of employment for medium enterprises - 50 to 249 workers – and 40% of employment for large enterprises – with 250 or more employees).

The concern with the dimension of our companies is associated with the idea that larger companies are more productive, ensuring higher levels of productivity, that is, a higher gross added value per employee. The data presented hereunder for the set of Member-States of the EU 27 are quite clear.

Pursuant to the last available data on this aggregation level (Source: Eurostat, Structural Business Statistics, 2005), the totality of companies of the EU 27 is distributed as follows in terms of Employment and Added Value:

EU 27 companies	% Employment	% GAV
Micro	29.6	20.9
Small	20.6	18.9
Medium	16.8	17.8
Large	32.9	42.4
TOTAL	100.0	100.0

The result, in terms of productivity (GAV in million Euros) is as follows:

EU 27 companies	Productivity	Productivity (rate)
Micro	29.9	70.7
Small	38.7	91.5
Medium	44.8	105.9
Large	54.4	128.6
TOTAL	42.3	100.0

We can assess these data in many ways, decomposing them either by country or activity sectors. With minor variations, they will always lead to two outcomes:

- Confirmation that Southern European countries, namely Spain, Italy and Portugal, are characterized by corporate universes with an over-representation of micro and small enterprises;
- Conclusion that such over-representation of micro and small enterprises contributes to a less satisfying performance of those economies in terms of added value, i.e., GDP per capita and income and consumption levels of the inhabitants.

The data presented below are just the result of one of the many possible options - by applying to the Spanish, Italian and Portuguese transforming industry the type of analysis performed above for the totality of the EU companies. The most recent data are from 2009:

Spain (Manuf.)	Weight employment	Productivity	Productivity (Rate)
Micro	21.5	26.9	57.2
Small	32.8	40.9	87.1
Medium	20.2	49.8	105.9
Large	25.5	69.5	147.8
TOTAL	100.0	47.0	100.0

Italy (Manuf.)	Weight employment	Productivity	Productivity (Rate)
Micro	26.2	23.6	55.6
Small	33.3	39.1	92.3
Medium	17.2	52.9	124.7
Large	23.3	60.5	142.7
TOTAL	100.0	42.4	100.0

Portugal (Manuf.)	Weight employment	Productivity	Productivity (Rate)
Micro	20.4	11.7	47.1
Small	31.1	18.8	75.6
Medium	19.1	25.7	103.5
Large	29.4	39.8	160.3
TOTAL	100.0	24.8	100.0

These data regarding the transforming industry of the three countries show that:

- A representation of micro and small enterprises even more accentuated than in the overall of European companies;
- An even more accentuated dispersion of work productivity, affecting micro and small enterprises and benefiting mainly large enterprises.

The imperatives of job creation and economic growth

The recent evolution of World Economy has been posing new challenges to the countries of the more developed regions, particularly economic growth and job creation.

After ending the recession that marked the beginning of the new millennium, as of 2003, the World Economy grew at the most higher rates ever, with rates ascending to 5%/year, up to 2007. After the most serious phase of the turbulence period started by the end of 2007, a growth rate of 5.3% was again reached in 2010 – but, even that year, the Unites States grew only 3%, and the Euro area grew just 1.9%.

The most recent evolution has not relieved our concerns, now with particular incidence in the Euro area and particularly the Southern European countries. Considering this year of 2012, and just the so-called developed countries, OECD is supposed to grow 1.6%, reaching 2.4% in the United States, with a contraction of -0.1% in the Euro area. In Spain, Italy and Portugal, GDP will decrease -1.6%, -1.7% and – 3.2%, respectively.

Unemployment rates will reach in 2012, and pursuant to the OECD forecasts (which may be surpassed), 24.5% in Spain, 9.4% in Italy and 15.4% in Portugal – values that are above the OECD average (8%) and above those of the United States (8.1%) and the Euro Area (10.8%, a rate above the 9.4% for Italy).

In a condescending assessment, we could accept that this is a transient situation that time will correct in a more or less extended period of time, but always within a reasonable timeframe. However, we do not think that this is the case: after assessing the situation in terms of growth rate of the so-called potential GDP (a future growth rate in the medium term, after discounting the effects of the conjunctural variation), this rate is currently of 1.7% for all OECD countries, having dropped to 2% in the United States and to 1.2% in the Euro Area. The value expected for Spain is also of 1.2%, whereas Italy and Portugal reach only 0.3% - the lowest values of the World (with the only exception of Greece), culminating a feeling of negative evolution that started long before the economic crisis started in the end of 2007.

So, it comes as no surprise that growth and job creation are at the top of the economical, social and political agendas of the developed World. And it is even less surprising that they are at the top of the agendas for Spain, Italy and Portugal, even if not considering the still relatively mild situations observed in Spain (in terms of growth rate of the potential GDP) and Italy (in terms of unemployment rate).

If the relevance of this subject seems unquestionable and unanimously recognised, such unanimity starts to disappear when, in a more analytical perspective, we seek the axis of what may be a corrective political intervention, even among those who know that there is not a sustainable solution for the growth and employment problems that does not include the companies. We would like to refer here, on this matter, the beginning of the intervention by Albert Bravo-Biosca (one of the most active researchers of NESTA, a British foundation dedicated to the study of these subjects) during the 3rd European Conference on Corporate R&D and Innovation CONCORD-2011, held in Seville, Spain, on October 6 of last year, titled "The Dynamics of Europe's Industrial Structure and the Growth of Innovative Firms":

> "Which are the firms that matter most? This is a question that has occupied, or preoccupied, policy makers, academics and business advocacy groups for decades. Many consider SMEs to be the most important source of jobs. Others point out that it is entrepreneurs who account for all new jobs. A third group highlights the disproportionate contribution of high-growth firms to job creation. And, finally, some argue that it will be high-tech or "innovative" sectors that will drive future prosperity.
>
> The evidence shows that there is truth in all these statements. Taking the US as an example, small businesses generated 64 percent of net new jobs over the past 15 years. This is mostly because young firms, which normally grow faster, also tend to be small. After controlling for age there is no difference in job creation between small and large firms in the US. In other words, small old firms do not create more jobs than large old firms on average (in fact, many lifestyle businesses do not aim to grow). This suggests that it is important to look instead at young firms. Over the last three decades start-ups have accounted for all US net job growth, in fact in many years they accounted for over 200% of new net jobs. This is possible due to the often forgotten yet important distinction between net and gross jobs. Gross job creation equals to the total number of jobs created in the economy, while

> net job creation subtracts from this amount the number of jobs destroyed. Since economies create and destroy a large number of jobs continuously, around 10 gross new jobs are created for each net new job in the US. This is how start-ups, as well as high-growth firms, can account for over 100% of net job creation. Start-ups make a very important contribution to job creation (some more than others), but they are not the only group of firms that creates jobs" (Albert Bravo-Biosca, NESTA, "A look at business growth and contraction in Europe", Seville, Spain, October 6, 2011).

As such, the key to the problems does not seem to be in:

- The small companies, which only apparently seem to create more jobs by the fact that they are younger. Removing that age effect, Small and Medium Enterprises do not create more jobs than large enterprises;
- The start-ups resulting from the entrepreneurial activity, in a more strict sense. Start-ups create more jobs in gross terms but create less jobs in net terms due to very high mortality rates:
- The technological companies (an aspect that the above text does not refer) as these represent just a small part of the existing companies. Consideration would be obviously very different if, rather than in the quantity, there is a specific interest in the quality of the jobs created.

The importance of fast-growing companies

This issue is raised in completely different terms if, in a more empirical and prosaic view, we are willing to simply look for the companies that show a higher growth and create more jobs – an exercise made possible by the powerful databases with simplified entrepreneurial accounts that most of the countries now have.

The response is given by Jonathan Kestenbaum, Chief Executive of NESTA in the preface of another work of reference from this Foundation, "The Vital 6% - How High-Growth Innovative Businesses Generate Prosperity and Jobs" (Research Summary, October 2009):

> "The research makes a powerful case that a small number of high-growth businesses are responsible for the lion's share of job creation and prosperity, and that innovation is instrumental in the success of these businesses.

> This has significant implications for the direction of economic policy. It shows that enabling innovation is good for growth. Just as importantly, it shows that focusing attention on growing businesses and promoting excellence, far from being an elitist policy, gives rise to widespread job creation and prosperity.
>
> We hope that this research will be a powerful contribution to the debate on how to foster economic growth."

And the executive summary of the same document further refers:

> "A small minority of high-growth businesses hold the key to job creation and wider prosperity. New research published by NESTA shows that the 6 per cent of UK businesses with the highest growth rates generated half of the new jobs created by existing businesses between 2002 and 2008.
>
> Although these companies came from across the country and from all sectors of the economy, they had one important factor in common: they were far more likely to be innovative, and the research shows that their innovation was a source of growth.
>
> This has important implications for the Government: it suggests that economic policy should focus on promoting innovation and on the small number of companies with high growth potential, rather than broadly based business support programmes for new start-ups and SMEs. More importantly, it shows that an approach of backing excellence and innovation is not an elitist policy: rather, it is the best way of generating employment and opportunity. This goal forms the basis of NESTA's research agenda, investment activities and practical programmes."

Fast-growing companies, fast-declining companies and bankrupt companies or the return to the "creative destruction" metaphor and confirmation of considerable differences between the european and united states development models

The most ambitious of all studies performed within the scope of the line of works here referred had its "preliminary and incomplete" results disclosed by Albert Bravo-Biosca in the draft paper "Exploring Firm Growth Across Countries", published by

NESTA on May 4, 2010 – originating a considerable series of presentations by its author, before and after this date, namely that held in Seville, on October 6 2011, already mentioned.

The work performed thanks to a relevant congregation of resources used the databases from companies, and these companies' accounts, for 11 countries (Austria, Canada, Denmark, Spain, United States, Finland, Holland, Italy, Norway, New Zealand and United Kingdom), covering three years of growth: 2002-2005, 2004-2007 and 2005-2008. In terms of growth, companies are divided into eleven categories, the extremes of which are comprised of average growth rates for the three years below -20% and above 20%, with nine intervals among them with a range of 5%, except for the intermediate interval related to growth rates for the three years between -1% and +1% (i.e., companies with practically stagnated turnover). Only the companies that at the end of each three-year period had at least 10 workers were considered (micro enterprises were therefore excluded).

We regret that Portugal has not been included in the group of countries studied, which would ensure us the availability of the databases and the possibility of accessing the methods used by the study – thus providing us, at least from the empirical point of view, a considerable edge for the comparison of the three countries (Spain, Italy and Portugal). As such, we will simply refer the most important conclusions, in addition to those already disclosed in the previous paragraphs.

For the generality of the countries, the conclusions are as follows:

- A minority of companies (from 3% to 6% of the total, pursuant to the already disclosed results) show a disproportioned contribution to job creation. "Fast growing companies" (those included in the higher category, with growth rates for the three years above 20%/year, in average) represent between 35% and 50% of the jobs created by all companies with 10 or more employees at the beginning of the relevant three-year period;
- It is probable that younger companies show a faster growing rate but most of the fast-growing companies have more than 5 years;
- It is very unlikely that a company remains as "fast-growing company" for an extended period of time. Under normal conditions, after a fast-growing

period, the company tends to return to more moderate growth rates, being replaced, in its status of fast-growing company, by other companies;

- There is a positive correlation between the percentage of "fast-growing companies" and the percentage of "fast-declining companies" (that is, the two extremes of the growth classes tend to have approximate relative relevancies, with supports the known Schumpeterian thesis of "creative destruction").

It is precisely related to this matter of "creative destruction" that appears a highly relevant difference between most European countries and the United States (and Canada, the country that, among those studied, shows the highest percentage of "fast-declining companies"):

- European countries, in general, show less "fast-growing companies" and also less "fast-declining companies";
- Europe shows a higher percentage of companies that remain stable throughout time;
- This difference in terms of behaviour is not explained by sectorial composition differences, tending to appear in all activity sectors;
- The difference appears in all size classes, although there is some evidence that medium size companies have more difficulties in challenging large size companies in Europe than in the United States;
- Whereas in Europe surviving companies showed a net increase of jobs over that of the overall private sector of the economy (3.3% and 2.1%, respectively, evidencing that new companies do not create enough jobs for compensating for lost jobs from non-surviving companies), in the United States it is the opposite (with surviving companies loosing 2.8% of their jobs in 3 years, even at a time of economical growth during which the private sector of economy witnessed a total job increase of 2.4%). These results show the higher relevance of the dynamics of the creation of new companies in the United States.

I would like to point out the fourth point, to which we will return later on, suggesting the existence, in Europe, of a regulatory board, or at least of a set of practices that hinder the growth of medium size companies when challenging the large size companies.

Creative destruction and increase of productivity

One of the most remarkable conclusions of these works is the one associating "creative destruction" (more than growth itself) to the increase of productivity. Once again, let us return to Albert Bravo-Biosca, in the draft paper "Exploring Firm Growth Across Countries", published by NESTA on May 4, 2010 (pp.2-3):

> "This new database captures the heterogeneity of firm growth experiences across countries in much more detail than previously done. It thus provides new insights on how creative destruction (or, more precisely, resource reallocation) happens in different countries. And as a result it may help to explain some of the productivity differences across countries.
>
> Aggregate productivity grows both when firms improve their internal practices as well as when resources are reallocated towards those firms (or plants) that have successfully developed superior practices. A more dynamic growth distribution, in which most firms expand or contract and only a few remain stable, is likely to accelerate both these processes.
>
> Firms improve their performance by experimenting with other ways of doing things, with the outcome usually being uncertain. Trying a new business model, exploring a new technology or launching a new product often requires setting up a new team, expanding a plant, etc. A dynamic growth distribution signals an environment in which firms seize the opportunity and take the risk to put new ideas into practice, while being able to backtrack and shrink without major consequences if they do not succeed. On the contrary, an economy without experimentation results instead in a much higher share of stable firms, and lower productivity growth.
>
> A dynamic growth distribution attests as well the degree of resource reallocation on-going in the economy. Some firms (or plants) perform better than others, so economies benefit when the best performing ones expand while those under-performing contract, and the effect is not small. For instance, the reallocation of output and labour towards more productive plants accounts for about half of total factor productivity growth in US manufacturing".

Brief reference to the results achieved by Spain, Italy and Portugal regarding the works already performed on fast-growing companies

We already had the opportunity of referring that both Spain and Italy were included in the group of eleven countries of the previously-mentioned study. The results fall within that what was expectable, as European countries, particularly:

- The reduced dimension of Spanish and Italian companies that, when including micro-enterprises, show an average size of 9.6 and 10.5 employees, respectively for Spain and Italy. The lowest value immediately following is the one concerning Finland, with 12.9;
- If micro-enterprises are excluded, that is, if only companies with more than 10 employees are considered, Spain and Italy still show the smallest average size with 48.3 and 46.9 employees, respectively. The lowest value immediately following is very close: 50.6 for Austria;
- With growth rates of 8.5% and 6.6% regarding turnover for the assessed three-year period, Spain and Italy respectively appear as two of the countries in which surviving companies are characterized by a higher growth (only surpassed, by far, by New Zealand);
- After this analysis, only surviving companies with 10 or more employees in Spain and Italy show growth rates of 6.3% and 3%, respectively, and continue to show higher growth rates, again with the exception of New Zealand;
- After distributing the companies by the eleven growth intervals, Spain is, of all European countries, the one with the closest result to the United States with 10% of its companies in the lower interval (decrease of turnover at a rhythm over -20%/year), 6% of the companies in the upper interval (fast-growing companies), and only 10% of the companies in the intermediate stagnation interval (turnover variation between -1% and +1%, in average for the assessed three-year period). These three percentages are exactly like those observed for the United States;
- Italy shows a distribution closer to that observed for most European countries with respectively 8% and 4% of the companies in the two extreme intervals (smaller and higher, respectively) and 12% in the intermediate stagnation interval.

In a presentation made by Alberto Bravo-Briosca, in Lisbon, on October 19, 2011 ("Exploring Business Growth and Contraction in Europe and the US"), based on recent information (Source: OECD-Eurostat EIP 2009, based on OECD Structural and Demographic Business Statistics Database), and this time including Portugal and other countries, with a much stricter information handling:

- Italy and Portugal appear among the countries with the lowest percentages of "fast-growing companies" (only 2% and 4%, respectively in the transforming industry and services, in Italy, for companies with more than 10 employees, with results for Portugal being only marginally above in both cases). Romania would be the only country, among those studied, with lower results;
- Spain appears in a better position with a percentage of "fast-growing companies" reaching 3% in the transforming industry and close to 5% in services, but sill in the "lower range" of the studied countries;
- To provide us with means of comparison, "fast-growing companies" reached 6% and over 4.5% in the United States, respectively for the transforming industry and services; however, these values are largely overcome in some of the new countries studied, like Brazil, Bulgaria, Slovakia and Latvia.

Implications of the relevance given to fast-growing companies, namely in terms of public policies

The results of the works being assessed here, evidencing the relevance of "fast-growing companies" for the creation of jobs and acceleration of economical growth have a high impact regarding public policies.

A cultural change

It is, first and foremost, a cultural change. In the place previously occupied by other policies (start-ups, technological companies, SMEs, companies in a problematic economic situation, priority regarding preservation of jobs, etc..) now appear the "fast-growing companies":

- Which are not just start-ups, although start-ups usually have present a fast growth;

- Which are not just technological companies with the possibility of appearing in any activity sector;
- Which are not mandatorily SMEs, although most of them are, further evidencing that, as it happens with large enterprises, most SMEs have a small growth, do not grow or even tend to decline, whether in terms of turnover or number of jobs created or preserved.

The relevance given to fast-growing companies does not decrease the relevance and attention that must be given to other obviously complementary intervention areas: that is the case of start-ups and technological companies. In other cases, coexistence is more difficult, and even a contradiction: that is the case of policies benefiting all SMEs indiscriminately, or, even worse, all the talk about protection of companies in a difficult economical situation or priority that should be given to preservation of existing jobs – the opposing vector of the "creative destruction" environment indispensable for the appearance of a larger number of "fast-growing companies".

If a change in the political action underlying culture is necessary, namely in defining priorities, the same occurs in companies, where culture may not be the most favourable to growth or, mainly, to the creation of the conditions indispensable for such growth (in detriment of others). However, we can all agree that, in terms of companies, more than culture, the attitudes and behaviours are what really count – and these can be easily changed, as response to alterations made to the context in which companies are forced to take their decisions, whether regarding threats or opportunities and mostly, regarding the incentives and prizes given by such context.

Infrastructure requirements

The most important of all infrastructure requirements is the one concerning the educational basis of the human capital available. We are referring here to the entire educational system, particularly higher education, which is expected to provide training, on a graduate level, to a high percentage of the active population, with predominance of the science and engineering areas. Holland, Finland, Germany and United Kingdom are usually referred as good examples of this type of policies.

There is also the effort required from the State in terms of R&D. Although the statistical information available and the studies performed show a higher relevance

of indicators like those related to the weight of GDP in corporate R&D (by opposition to the relevance given to the most conventional indicator of GDP weight in all R&D costs, including public costs), it seems difficult to create an environment where corporate R&D has a higher impact on GDP without the State simultaneously achieving minimum critical values of R&D costs.

We are referring here to the R&D component that follows the higher education system, in Universities, and R&D eventually carried out by other public bodies, namely in terms of fundamental research matters.

However, it must be noted that not all R&D public effort must fall in direct public costs. In some countries with a better innovation performance (Canada, Japan, Holland, Korea), the largest part of R&D public costs is comprised of tax incentives regarding corporate R&D – pursuant to the report line that nowadays tends to be more predominant and which accounts for public cost as tax incentives, with the consequent "loss of income" for the State. To a smaller extent, the United Kingdom and France also follow actively this type of policies.

Innovation in the companies

A growth and employment policy focused on "fast-growing companies" can only be achieved, in all that is essential, by companies. It seems difficult for a company, any company, to start a fast-growing itinerary without the base of an innovative culture their own decision of opting for fast growth represents, in itself, a major innovation.

We need a larger number of innovative companies, but really committed innovative companies, not just stating that they are innovative. The several available innovation scoring instruments refer the requirements for an innovative company, allowing us to persist here in aspects such as:

- Formulation of goals in terms of sale of new products and services or, at least, sale of already existing products and services but with significant improvements. In the long term, these goals are essential, without loss for the role to be played, on the short term, by other goals such as expanding the number of markets or even the number of clients in pre-existing markets, exploring the already existing product base;
- Integration of innovative people, namely new employees with higher education degrees particularly in the science and engineering areas;

- Investment in innovation, namely R&D, in a more conventional sense;
- Investment in other intangible assets, like branding;
- Proper management of all aspects related to intellectual property, particularly patents.

Importance of intangible investment and creation of intangible assets, mainly in the companies

When we referred the relevance of investment in innovation by the companies, highlighting investment in R&D in a more conventional sense, we were not sufficiently clear in what concerns the extension of desirable investment.

The way this type of information is handled and assessed must be improved.

The most-used indicator for, in aggregate terms, evaluating the effort of a country in research and development, and, more generally, in innovation, is the weight of GDP in R&D costs – not all costs can be characterized as investment as they include cost classes that will be no longer considered as current or consumption costs (including at least a part of costs related to human resources).

Perfectioning of a statistical base, and later studies, evidenced the importance of the weight of GDP in R&D costs made by companies – if not as a measure of the effort made by the country, at least as a factor that impacts to a high degree of probability the efficacy of such effort in terms of created economic value.

It is now the time to consider that not all R&D costs from the companies has the same efficacy in terms of created economic value, pointing out the relevance of intangible investment which can result in the creation in intangible assets, in particular:

- Costs with more conventional R&D activities, including acquisition of design and industrial property;
- Costs with software development and acquisition of software an databases;
- Costs often considered as investment costs and related to the acquisition of "economical and management skills", such as training, organizational development, branding and marketing.

United States are probably the country that best considers these "economical and management skills" with large investments from the companies. Among the rich countries, Japan is the opposite example, with an investment still very focused (and highly successful) in more traditional R&D, of a technological nature, made by companies with a strong support from the State – conversely to the United States, where the State has less weight in the financing of corporate R&D.

The state as catalyst of innovation

We have already mentioned the relevance given to the creation and maintenance of an infrastructure base it being, in most countries, the responsibility of the State or, at least, requiring a high level of public investment. We refer more precisely to the creation of human capital by the higher education system and the creation of a R&D base, namely in what concerns more basic research.

As important as the role placed in the creation and maintenance of this infrastructure base, the State has also a role in a function that can be consider as a "catalyst" of innovation, which would include:

- Direct support to companies, as financial incentives and mainly tax incentives regarding corporate innovation, namely corporate investment in R&D;
- Creation of a favourable environment and conditions for entrepreneurialism and creation of new companies, with particular focus on technologically based start-ups;
- Respect for the effective competition regulations, giving particular attention to violations that can limit the challenge of companies with high market shares by small and medium size companies regarding their competitors;
- Protection and imposition of a respectful environment regarding the different ways of intellectual property;
- Imposition of standards and accreditation requirements, either for products or the exercise of certain activities;
- Leading a public procurement policy regarding the acquisition of innovative goods and services, with particular focus on the acquisition of products still under development, in a pre-competition stage. Italy is, of the three countries encompassing COTEC Europe, the most advanced country in this area, where countries like the United Kingdom and Finland have more expressive policies, immediately followed by France.

An important implication of the relevance given to "fast-growing companies" in terms of public policies formulation is the possibility of a larger number of incentive systems be configured as "prize" for marginal results: increase of R&D investment, increase of sale volumes and operation results, increase of the number of jobs, improvement of average qualification of staff and others of the same type.

The decisive role of venture capital

It is not possible to make companies grow without providing them with a permanent capital – which sometimes forces to changes in the shareholder base and in management skills or in the organizations' top.

Venture capital, in all its expressions (seed, start-ups, early development and expansion) is an indispensable component for an economy that includes fast-growing companies – mainly if such economy also includes a high number of business entrepreneurs and the creation of a high number of new companies. We refer both to the contribution of capital and to management skills, sometimes very specialized, that the venture capital industry can bring to the companies in which it invests.

In small countries, without a sufficient dimension for justifying a continuous presence of venture capital operators, either those of large size or those more specialized, a voluntary political action may be necessary, capable of stimulating these operators to a more continued follow-up, more attentive to the investment opportunities offered by companies with their head offices in the country.

Bibliography

BIS – Department for Business Innovation and Skills (January 2011), "Annual Innovation Report 2010", NESTA.

Bravo-Biosca, Albert (May 4, 2010), "Exploring Firm Growth Across Countries", FORA-NESTA research report.

Bravo-Biosca, Albert (November 2010), "Growth Dynamics – Exploring Business Growth in Europe and the US", FORA-NESTA research report.

Bravo-Biosca, Albert (October 6, 2011), "The Dynamics of Europe's Industrial Structure and the Growth of Innovative Firms", presentation made on the 3rd European Conference on Corporate R&D and Innovation CONCORD-2011, held in Seville with the subject "The Dynamics of Europe's Industrial Structure and the Growth of Innovative Firms".

Bravo-Biosca, Albert (October 19, 2011), "Exploring Business Growth and Contraction in Europe and the US", presentation made on a seminar organized in Lisbon on "Empresas Gazela e Empresas de Elevado Crescimento" (gazelle companies and fast-growing companies)

Bravo-Biosca, Albert (13 December, 2011), "Exploring Business Growth and Contraction in Europe and the US", presentation made on a seminar organized by Bruegel, a think tank located in Brussels and focused on International Economy.

COTEC Portugal (2007), "Innovation Scoring – Manual de Apoio ao Preenchimento".

Crowley, Theresa and Bravo-Biosca, Albert (MArch 10, 2009), "The Innovation Index Project", presentation at NESTA.

Eurostat (2012), "Structural Business Statistics",

Eurostat/OECD (2007), "Eurostat-OECD Manual on Business Demography Statistics".

IMF (2012), "World Economic Outlook, April 2012 – Growth Resuming, Dangers Remain".

Mason, Geoff, Bishop, Kate e Robinson, Catherine (2009, October), "Business Growth and Innovation – The Wider Impact of Rapidly-Growing Firms in UK City-Regions", NESTA research report.

NESTA (October 2009), "The Vital 6 Per Cent – How High-Growth Innovative Businesses Generate Prosperity and Jobs", research summary.

OECD (2012), "OECD Economic Outlook May 2012".

Sarmento, Elsa de Morais e Nunes, Alcina, "Criação de Empresas em Portugal e Espanha: Análise Comparativa com Base nos Dados do Banco Mundial", Working Paper, CEEplA – Centro de Estudos de Economia Aplicada do Atlântico, Universidades dos Açores e da Madeira.

Demand side – policies of Innovation:
The Public Procurement of Innovation technology

Contents

Motivations and tools of demand side policies

Despite the fact that demand can constitute one of the main sources of innovation, public policies which use demand as innovation process driver have been elaborated just in recent years.

This phenomenon is occurring in both UE and in single Member States, with particular emphasis on public demand for products and services (Public Procurement)

It is possible to define a demand side policy of innovation as "all the public measures to stimulate innovation and/or to speed the spread of innovations through the increasing of innovation demand, the definition of new functional requirements for products and services and the best demand articulation".

This very general definition highlights two possible articulations of this policy: to promote both the creation of innovations and their spread.

A broad conception of innovation is generally accepted: to create something new not only in absolute terms on global scale but also for a single company or for a single geographical area.

Recourse to demand side policies for innovation is justified by the following considerations:

a) To overcome the failure of the market mechanisms
b) To efficiently meet the needs of society
c) To promote the modernization of production system
d) To promote the technological competitiveness of local production systems and to create "lead markets".

More specifically:

- for a) there are problems concerning the availability of adequate information about the innovative technologies and the spread of these information, caused, for example, by weak market indicators which discourage the trust of potential users, or by the radical nature of innovation, which involve an high uncertainty concerning the actual economic value of its applications in different contexts.

The potential users and their organizations often lack an adequate skill to absorb technological innovations, due to constraints and deficiencies in science and technology education of company staff and in its adaptation to the technological dynamics.
Often there are no mutual comprehension between innovation makers and potential users, because of the uncertainty and the lack of transparency of future perspectives.
Finally in many cases market mechanisms are useless in translating the users' needs into functional and specific requirements which may be comprehensible for the producers.
This is important also for countries that are not in technology and innovations frontiers.

- For b) the articulation of demand side policies include the response to the needs of society and their translations into specific and concrete innovations that allow to provide more efficient and effective public services.
  Examples of concrete applications of this approach to innovation promotion in several P.A. sectors are numerous.

- For c) in addition to the achievement of higher efficiency and efficacy in public services, innovations can be useful to increase the productivity of the economic system through the modernization of productive structures.
  For this purpose processes of innovations spread are particularly efficient, even more than creation of the selves.
  In this sense the actor and the place of innovation are less important than the propagation mechanisms of the innovation for other actors and other territories.

- For d) demand side policies may also contribute to the implementation of industrial policies aimed to promote innovation of companies in a specific territory (region, country). Moreover in this actions tensions and contrasts can rise between the Public Procurement intent to acquire innovative solutions – often provided by big international companies - and the initiatives of local development that favor local companies, first of all the PMI, not necessarily capable to provide best innovative solutions.

The manifold measures conceived and implemented according to this approach towards the policies for Research and Innovation (R & I) can be grouped as shown in the attached table, in which measures for offer side policies are underlined as well.

Measures concerning demand can be attributed to the following lines:

- PA purchasing is not directed, as usually, to standard and successfully tested products/services, but more to innovative goods , to be developed ad hoc to better meet PA needs.
- technical rules and regulations concerning products in order to improve the performances (particularly concerning the environmental impact) which encourage the companies to renew their products.
- incentives (financial, fiscal, etc.) to stimulate innovation private demand that for several reasons (first of all, their production high price and consequently sale high price) are hardly included in the market
- system actions to promote the constitution of cluster and productive chains in order to facilitate the integration of customers and suppliers.

It is clear that this taxonomy of measures is a simplified representation of reality, because innovation policies often use appropriate combinations of elementary measures.

Motivations and methods used to elaborate and implement different lines of demand side intervention are illustrated here, with particular attention on PA purchases (PP of Technological Innovation –PPIT) and the consequent difficulties for PMI.

Public Procurement of Innovative Technology (PPIT)

The motivation and impact of PP of Innovative Technology

Recourse to purchasing by the public authorities to stimulate the development of innovative products/services is justified primarily by the huge size of this spending, with the result that even a small fraction of it makes available a significant mass of financial resources with which to encourage innovation in companies.

This is particularly true in the fields of public spending on healthcare, transport and construction.

It enables governments to purchase products at higher prices or to reduce the efficiency of the solutions adopted, in order to achieve more significant results in the field of certain social and public policies. They can experiment with innovation, when existing, and less expensive solutions, do not fully meet performance requirements, even taking on the risk related to the purchase of a new product, which is occasionally only defined at prototype level.

The public purchaser, equipped with the necessary technical skill, can induce the development of innovation by suppliers, or even act as co-developer, stimulating suppliers to innovate in order to meet users' needs better.

What is more, with their purchases, governments can boost the market for certain goods, thus supplying incentives to private investments in innovation. To this end it is essential to reach a suitable critical mass of public purchases, for example, by combining the demand of several public operators or coordinating their spending decisions.

In the end, the benefits that can be obtained with the PP of Innovative Technology may be identified as follows:

- stimulating the output and increasing the competitiveness of companies in new markets, by creating new businesses and boosting employment
- improving the "quality" of the services offered by the authorities to the public and to companies, and/or reducing their costs
- introducing new products and processes which, although not used by the authorities, entail substantial public benefits (externality), which in the end cut the cost of government activities and improve the quality of life.

In this way, the PP of Innovative Technology makes it possible both to boost the competitiveness of the manufacturing system and to respond better to the great challenges of society (in the fields of healthcare, environment, energy and transport with the goals of sustainability, social inclusion, etc.).

This specific impact can be defined as direct and indirect effects that public demand can generate on the economic and social system generally.

The ways of implementing the PP of Innovative Technology

The PP of Innovative Technology is implemented in various ways; they break down as follows:

a. Strategic procurement vs. General procurement
b. Procurement for public uses vs. Procurement to stimulate private demand (Catalyst procurement)
c. Commercial procurement vs. Pre-Commercial Procurement (PCP)

More specifically:

- for a) Public purchases may be organised so as to generally increase innovation, because innovativeness is taken to be a fundamental criterion for the evaluation of offers (General Procurement).
  In other cases, the demand for innovative technologies (products and services) aims to stimulate the development of the market in specific fields of application (Strategic procurement)

- for b) In some cases, public demand aims not to satisfy the authorities' functioning requirements, but rather to stimulate purchasing decisions by the public regarding products with a strong social significance, for which market mechanisms are clearly failing (high risk and scarce demand). In these cases the Authorities act as the initial purchaser of innovation, with the expectation that the public will follow their example and eventually form the most significant part of demand (Catalyst procurement).

- for c) The basic idea behind Pre-Commercial Procurement (PCP) is to define and acquire innovative products and services that demand R&D activities. This spreads the technical risk between the purchaser and the supplier. In practice, an R&D service is purchased and entrusted to a supplier in a multi-stage process, from establishing the innovation specifications to R&D activities, the construction and testing of a prototype, and the supply of a small production run, which will be followed by full-scale marketing.
  The co-financing of R&D activities by the supplier makes it possible to avoid rigid public purchasing procedures.

Unlike Commercial Procurement, it gives the commissioning body greater freedom of choice and of interaction with the supplier. This recognises the uncertainty that characterises innovation specifications and the need for more intense and continuous interaction between the Authorities and the developing company.

The problems of the implementation of the PP of Innovative Technology

- Even if the concept of the PP of Innovative Technology is extremely interesting because of the huge impact that it can have on innovation in the manufacturing system, its concrete implementation comes up against a number of obstacles and difficulties, to which the experiments attempted up until now have still not offered a fully satisfactory solution.
  First of all, the complex departmental and sectorial structure of the administration must embody widespread awareness that public sector spending can induce and spread significant innovation in the market. However it is also necessary to overcome the diversification between the organisational units of the government (ministries, departments) that are responsible for innovation and those responsible for spending, which have the financial resources with which to "acquire" innovation. But in this action, the latter acquire an additional role, over and above their institutional responsibilities, i.e. the generation of innovation, which requires profound changes to their decision-making processes, where the definition of goals, the formulation of finalised policies and their implementation are concerned. Even if this new dimension of the decision-making processes of the government units responsible for spending on the supply of services is certainly stimulating, their implementation still demands the redefinition of the decision-making routines and can therefore cause conflict. In fact, the purchasing decisions that optimise sectorial goals are significantly different from those that optimise innovation goals.
  It is also possible for the suppliers of innovation to be outside the consolidated group of suppliers of conventional solutions.
  And finally, the costs of change arising from the adoption of new application solutions may appear too high, partly because they entail processes of learning and of organisational-managerial adaptation that cannot be overlooked.

These problems can only be overcome by adopting a strategic orientation and commitment to innovation in the various sectors of the administration, making it possible for sectorial policies to be combined with those for innovation, coordinating any intervention in order to optimise the results. In other words great coordination is necessary between the various ministries (departments), based on the conviction (to be developed) that it is possible to implement successful initiatives for all the sectors ("win-win" situations).
It is therefore a complicated and difficult process, due to the institutional rigidity and verticalisation of the decision-making processes, on both a political and an administrative level, requiring the determination at the highest levels of government to integrate and coordinate the many different sectorial policies.

- Where the link between Public Procurement and private demand (Catalyst Procurement) is concerned, the difficulty lies in integrating the needs defined by the Government with those expressed by individuals, which may be the result of different perceptions and evaluations.
  The Administration's purchasing decisions must take into account and be linked to consumers' readiness to purchase the innovations proposed by the authorities and consequently to plan any intervention in a fit manner. The more public policy is aimed at modifying consumers' behaviour, the more Catalyst procurement must be supported by other forms of intervention. In the U.S.A. the commercial validation of innovation is left to private finance (Venture Capital), which decides whether it is convenient to invest in the commercial development of the innovations generated by R&D projects funded by public bodies
  Experience in this field has focused in particular on renewable sources of energy: the case of Sweden is significant. There, a broad range of measures has been adopted to stimulate the purchase of innovative energy technologies by the public: the dissemination of information, demonstrations with the users, and financial incentives to manufacturers to reduce the price of innovative solutions. Generally speaking, it is considered advisable to support Catalyst procurement with legislative intervention in order to increase the probability of a growth of private demand.

- Another problem regards the choice of the markets and technologies to develop using PP.
  On one hand, suppliers must receive timely indications about the actual evolution of public demand; on the other hand, uncertainty remains regarding the technological innovation that producers are actually able to supply. It is a question of coordinating and integrating demand and supply from the initial stages of their interaction.
  However it is very difficult and complex to anticipate the needs of the future and to translate them into significant market demand.
  To achieve these results it is important to activate forms of participation between the administration and the suppliers, which can identify real demand on the part of the administration that can be satisfied by the innovative solutions developed by suppliers.
  To this end, recourse to the methodologies of Foresight is very useful, making it possible to explore and contextualise the future directions of technological development and the future needs of society, creating a vision of the future that is shared by the administration and by suppliers.
  However, if the Authorities are to agree with possible suppliers which innovative solutions to develop to meet their own requirements in the supply of services to the public and to companies, they must be able to understand and evaluate the possible technological development. In other words, the authorities must be equipped with suitable technological skills oriented to the future, to enable them to interact consciously and proactively with potential suppliers. If this is not so, they run the risk of being captured by these companies, purchasing solutions that are ready-made or in any case calibrated to the interests and the available supply of these very companies.

- It is important to point out that many of the difficulties surrounding the conception and implementation of effective solutions for the Public Procurement of Innovative Technology derive from the presence of a wide range of goals that the administration sets itself with this type of action, such as the increased sustainability of economic and social processes, the inclusion and modernisation of manufacturing structures, the growth of employment and the support to SMEs. These are goals that are conflicting

and divergent in many ways, which it would be difficult to pursue together, contextually and simultaneously.
The development of innovation may prove to be in conflict with the growth of employment, and support to SMEs may conflict with sustainability, if this translates into large projects that may be tackled successfully only by large oligopolistic companies, while increased efficiency may conflict with the assignment of contracts to SMEs.

Attempts to implement the PP of Innovative Technology

At EU level, a number of initiatives have been conceived and experimented for the practical implementation of the PP of Innovative Technology, with two different approaches: the purchase of innovative products and services on one hand, and the purchase of R&D services on the other. This second line of intervention has been based on the experience of the SBIR Programme launched in the U.S.A. in 1982, and is known as Pre-Commercial Procurement (PCP) in Europe.

The SBIR model has inspired some initiatives in EU countries such as the United Kingdom and the Netherlands, overvaluing the aspect of PP that is embodied in this model. In the U.S.A. there are numerous variants that depend on the Agency involved, which often does not aim to achieve R&D results that it can use itself; one exception is the projects financed by NASA and the Department of Energy – DOE.

What is more, the SBIR – DOE model envisages additional financial incentives to companies to market the results of their own R&D projects. In any case, there is no automatic link between the R&D projects financed and purchases of innovative products, which are the responsibility of other units of the Agency.

In this sense, the SBIR programme channels the financial resources of the various Agencies to R&D goals in a wide range of sectors, only a small part of which target the subsequent purchase of innovative products.

In EU countries, PCP and the purchase of innovative products (now at stage 4 of the innovation cycle) have been implemented in various ways, while the approach to goals, policies, priority destinations, the size of intervention, etc. varies

Three methods are adopted to implement PCP:

- the purchase of the R&D services is activated by the authorities to meet their own needs, on the basis of their own use
- it is activated by a public entity as PPP (Public Private Partnership) for another public entity
- it is activated by a public entity to allow the results to be used by a group of private users when there is evident public interest (for example, leading to the development of a new public good). This is basically what is known as Catalyst procurement.

Even with regard to the Procurement of innovative products, there are various options for its implementation. For example, the Netherlands experimented an integrated approach based on the idea that the commissioning body should collect information regarding the innovative solutions that are available through "dialogue" with the market, and should implement the innovative solution selected gradually (through pilot projects), in order to reduce the risks and uncertainties connected to large scale innovation projects.

During the implementation of supply contracts, the commissioning body may encourage suppliers to propose innovation to cut costs on the basis of engineering processes and the project's success and the improvements achieved will be highlighted in audits.

The most recent national experience in the field of the PP of Innovative Technology was launched in Spain following the approval of a law regulating the INNODEMANDA programme in 2010, which introduces the various PP tools into local government practices, aiming to channel 3% of total public spending to this end in 2012.

The INNOCOMPRA programme is also active; it implements the PP of Innovative Technology in cooperative programmes between the State and the Autonomous Regions.

In Italy the most significant experiments with the PP of Innovative Technology have recently been put in place on a regional scale, by the Lombardy regional government and the Autonomous Province of Bolzano - Alto Adige.

The first case follows the PCP model, initially defining the specifics of the innovative technological solutions required to improve the offer of services to the community through detailed analysis of Foresight (Technology and Social). These specifics were then validated by ample consultation between the users and potential suppliers. In order to promote the competitiveness and innovation of the regional manufacturing system, participation in competitions for the implementation of R&I projects has been reserved to companies with a stable manufacturing structure in the region, setting aside a minimum share of the budget for SMEs.

The PP of Innovative Technology and SMEs

In order to assess the impact that the PP of Innovative Technology can have for SMEs we should highlight the benefits that companies generally expect from this approach.

Very basically, companies that supply innovative products/services to the Authorities must first verify whether the market create by public demand will be sufficient to justify the necessary investment, and whether they have the skills, knowledge and technological equipment necessary to meet this demand.

Companies have to take these decisions in conditions of uncertainty, and therefore with elements of technical and economic risk.

In fact a number of problems emerge regarding the efficiency of the PP of Innovative Technology in determining benefits for companies, such as:

- negotiations between the Authorities and possible developers to define the functional and not constructive specifications of innovation are part of a complex process, which also demands huge resources (financial, professional, time, etc.);

- if it is based on strict criteria of innovativeness and the optimisation of public spending, the selection of the company that will develop the innovation may entail the exclusion of local companies, often the priority goal of governments' industrial policies, in favour of large international corporations;

- on a vaster scale, the procedures to assign supply contracts are based on criteria of transparency (not discrimination) and openness to every possible

manufacturer, without guaranteeing any differential advantage to the company that has developed the prototype of the innovative solution;

- in many cases the supply may be of a considerable size, partly as an effect of the aggregation of requests for similar innovative solutions from different Authorities, in order to achieve economies of scale;

- and finally there is a problem regarding the intellectual property of the results (IPR) obtained in the context of a contract for the Public procurement of Innovative Technology (particularly in the case of PCP), for example, regarding the terms for the concession of patent rights and the price of the IPR.

What SMEs expect from PPIT

In order to explore and analyse that problems highlighted by SMEs regarding the use of PPIT, we decided to carry out a direct empirical investigation of an unstructured sample of these companies. A questionnaire was drafted that focused on the following elements:

a) awareness of the functioning of PPIT and its possible experimentation
b) the difficulties encountered when competing for technological innovation development contracts awarded by the Authorities
c) the benefits resulting from the implementation of said contracts
d) the expected conditions and benefits from the use of the tool of PPIT.

The questionnaire was distributed to companies in Italy, Portugal and Spain in collaboration with local business associations, but only a limited number of replies have been received so far.

The questions related to selections b) and c) remained substantially unanswered, whereas the companies interviewed provided exhaustive replies to the questions in section d).

These answers, with those for a), were processed statistically and the results are given in the table below.

QUESTION	Italy		Spain		Portugal	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Do you know Public Procurement of Technological Innovation?	10	90	12	88	27	73
Would you be interested in knowing more?	95	5	95	5	95	5
Do you know any similar tender in another country?	0	100	19	81	0	100
Do you consider that the Enterprise developing the innovation requested by Public Administration should keep intellectual property of the result?	76	24	80	20	89	11
Do you believe that local Public Administration should keep for local enterprises to participate in technological innovation provision tenders?	65	35	75	25	56	44
Do you consider that Public Administration should enforce a minimum participation of SMEs in innovation provision?	72	28	69	31	77	9
If the innovation was a prototype, Do you think that the enterprise making it should have any privilege under a possible subsequent and at a great scale demand by the same Public Administration?	95	5	94	6	100	0

Even if at the time of the survey the vast majority of the companies did not have a clear idea of the existence of PPIT, they did show considerable interest in finding out more.

In particular, SMEs expect that:

- the intellectual property of the results will be granted to the company that achieves them
- the local authorities must reserve participation in competitions for the supply of innovative technology to local companies
- the authorities must establish a minimum share for the participation of SMEs in the supply of innovation
- the authorities must favour the company that has developed the innovation prototype in the subsequent competition for the large-scale supply of the industrialised innovative solution.

It is evident that the requests and expectations of SMEs regarding the ways PPIT is implemented come up against the rules followed in the experience so far, particularly those that aim for maximum transparency and ample access, to guarantee the "best value for money" in all purchases, even those of innovative technologies.

It is obvious that we must find a compromise and a balance between the needs of the authorities (first of all, by obtaining the best innovative solutions for their own operations at the lowest possible expense, but also by favouring the growth of the local entrepreneurial system) and the expectations of companies (achieving greater competitiveness and a better position on the market, combining their own resources with those provided by the authorities).

Possible initiatives for SMEs

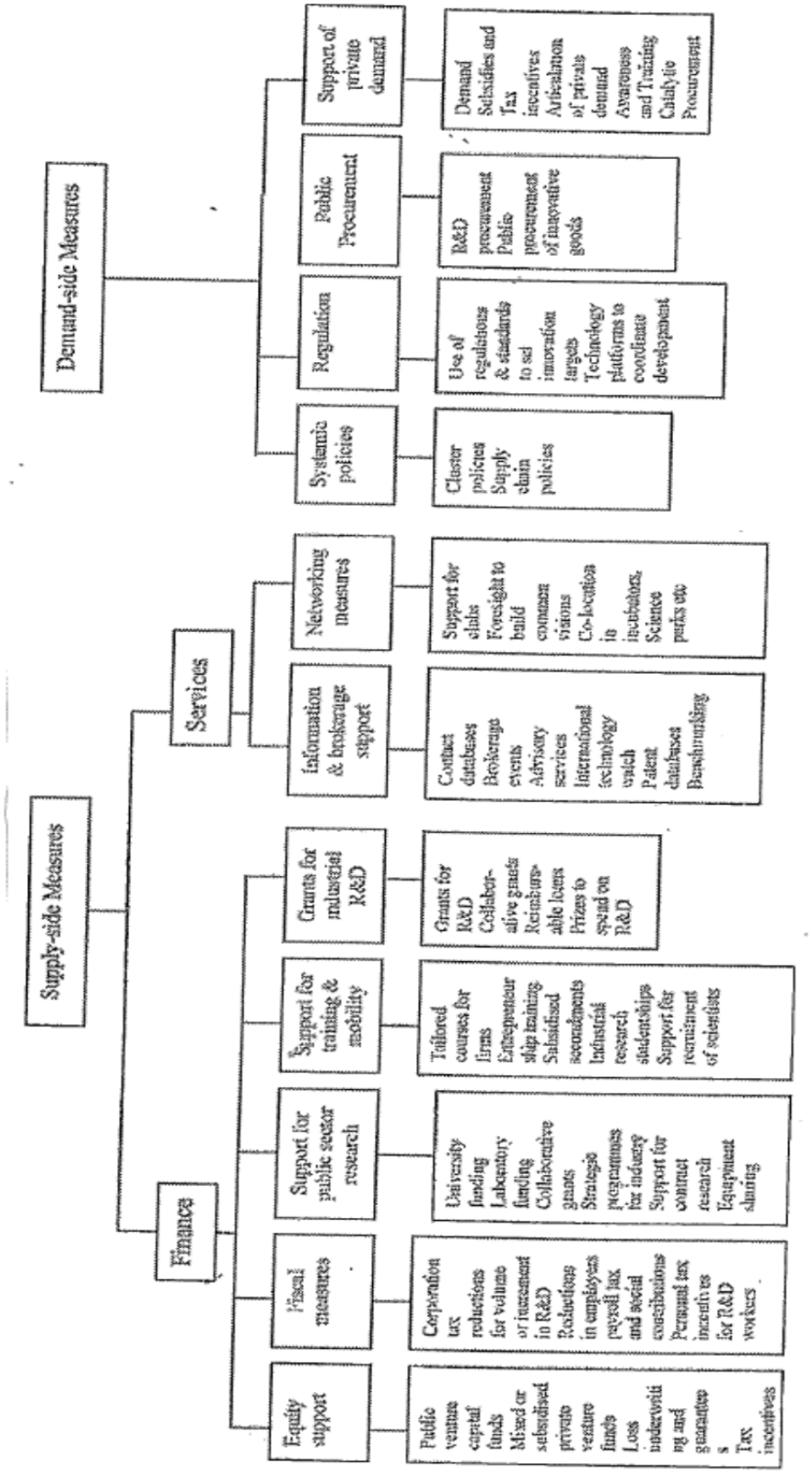
Generally speaking, the absence in Europe of systems regulating public contracts that can make it possible to favour SMEs, unlike the situation in the U.S.A., poses obstacles that are hard for those companies to overcome in order to access the PP of Innovative Technologies.

However, there are some cases in which SMEs have had significant access to the PP of Innovative Technology: programmes in the United Kingdom and the

Netherlands, in which the majority of the parties to the contracts were SMEs, often collaborating with other companies and research centres, with the goal of being able to supply the innovative solutions requested by the authorities.

These programmes have the following characteristics:

- simple, rapid procedures for the assessment (1st stage) of concise proposals for the grant of relatively limited funding.
- the possibility of implementing a direct link with potential users
- contracts structured to define the functional characteristics of the solution to be supplied, rather than research activities to be performed without a precise end result
- rules to define the intellectual property of the results, which confine them inside the project without including the expertise built up
- the possibility of rapidly finding a first client.


Demand-side Measures
Supply-side Measures
Finance
Services
Equity support
Fiscal measures
Support for public sector research
Support for training & mobility
Grants for industrial R&D
Information & brokerage support
Networking measures
Systemic policies
Regulation
Public Procurement
Support of private demand
Public venture capital funds Mixed or subsidised private venture funds Loss underwriting and guarantees Tax incentives
Corporation tax reductions for volume or increment in R&D Reductions in employers payroll tax and social contributions Personal tax incentives for R&D workers
University funding Laboratory funding Collaborative grants Strategic programmes for industry Support for contract research Equipment sharing
Tailored courses for firms Entrepreneurship training Subsidised secondments Industrial research studentships Support for recruitment of scientists
Grants for R&D Collaborative grants Reimbursable loans Prizes to spend on R&D
Contact databases Brokerage events Advisory services International technology watch Patent databases Benchmarking
Support for clubs Foresight to build common visions Co-location in incubators, Science parks etc
Cluster policies Supply chain policies
Use of regulations & standards to set innovation targets Technology platforms to coordinate development
R&D procurement Public procurement of innovative goods
Demand Subsidies and Tax incentives Articulation of private demand Awareness and Training Catalytic Procurement

Innovation ability of SMEs: a taxonomic approach

Contents

Executive summary

Small and medium enterprises (SME) account for the vast majority of all firms in all countries, although main features in Italy, Portugal and Spain are the very small number of large companies when compared to the major European countries and the abundance of enterprises with less than ten employees. This distribution represents a competitive disadvantage, since company's productivity grows with company's size. Consequently, any measure directed to promote SME growth will result in an overall productivity increase.

Best way to grow any business is innovation, and this activity has a dual effect on SMEs. On one hand, innovative SMEs are more competitive which allows for an increase in revenues, and this results in a higher growth which would make companies more productive, on the other hand.

Most current concept of innovation involves anything that stimulates citizens (consumers, workers or business people) to use all kind of knowledge towards the creation of new value. This definition belongs to a broader sense than the one initially accepted, when innovation responsibility assigned to enterprises and knowledge used was limited to the one coming from natural sciences. This means that we are talking now about "innovation in a broad sense."

SMEs which were born from innovative citizens do have needs of marketing and organizational innovations (non-technological), and due to their small size, they can rarely devote individuals and media exclusively to innovation. For this reason, the concept of innovation in a broad sense suits very well to SMEs.

The way in which we understand innovation in a broad sense today still keeps however major gaps. First one is related to the way knowledge supporting non-technological innovations is generated and transferred. Second, involves innovation management carried out in the absence of specialized internal departments (hidden innovation in productive activity). Third gap focuses on the patterns establishing SMEs propensity to innovate. This paper is a contribution to provide some answers to this third topic.

Patterns determining proneness to innovate are reflected in Cotec model for "innovation in a broad sense". Innovative companies decide to opt for innovation, recognize it as an additional operation and appreciate it. Model assumes that to opt

for innovation there should be a culture, and a strategy and planning to a certain extent. Enterprise will only recognize innovation as an operation if people and resources, processes and tools are dedicated to some degree. And it will become aware of the value of its innovations if somewhat it records those profits coming from the new products, processes and services, includes those innovations in its balance sheets as intangible features and takes advantage of them to improve its image.

A very simple questionnaire has been designed from this model, which has already been completed by more than one thousand enterprises from Italy, Portugal and Spain. The statistical analysis of their responses allowed to know that SMEs are grouped in five clusters, which have been named as "No innovation", "Scarce innovation", "Image innovation", "Latent innovation" and "Consistent innovation".

This model has proven to be useful to evaluate the innovative behavior of SMEs, and it is possible to perform both a self-evaluation process as well as a process guided by experts who can certify the validity of the answers. In addition, it has also enabled the development of a set of recommendations for each SME to decide the most useful ones to improve its position. The model should also help to define business strategies and to create public policies particularized to each different cluster. Software to apply this model and allowing for a self-evaluation mode, has been installed at Cotec Spain website.

Introduction

Small and medium enterprises constitute a critical part of productive structure. SMEs mean more than 99.5% of total enterprises of any European country, and at least contribute to the 50% of its GDP employing to more than 60% of workers.

There are however differences among European economies being the biggest one related to big- and micro-enterprises rates, as well as their contribution to added value and employment. Thus big enterprises (more than 250 employees) in Germany and the United Kingdom (UK) represent around 0.5% of all companies, provide approximately 65% to GVA and 45% to employment, while in Italy, Portugal and Spain, which are our three Cotec Countries, big enterprises scarcely reach 0.1%, and their contribution to GVA and employment is 30% and 20%, respectively. Furthermore, microenterprises (less than 10 employees) are overwhelmingly a majority in our three countries. More than 92% in number, and provide 30% to GVA and 40% to employment. These companies are only 85% in number, and contribute with 20% to GVA and employment in Germany and the UK.

If medium (between 50 and 250 employees) and big enterprises were compared among those countries relative to their population, it can be seen that distances are reduced since in Italy there are 333 medium companies per million of residents, 421 in Spain and 533 in Portugal, these are values which do not excessively differ from 432 in the UK or 597 in Germany. Concerning big enterprises, there are 53, 78 and 69 companies per million inhabitants in Italy, Portugal and Spain, respectively, while there are 102 in the UK and 117 in Germany.

Differences are much bigger for the relative number of microenterprises. There are 52.000 per million of residents in Spain, 60.000 in Italy and 66.000 in Portugal, while in Germany and in the UK there are only 19.000 and 24.000, respectively. This appears to show that in our three countries there is a higher trend to self-employment (enterprises of 0 employees, whose staff is exclusively constituted by the entrepreneur and his/her relatives), and those companies with employees appear to suffer more difficulties or have a lower propensity to grow or to merge with other companies to become bigger.

When comparison between added value and employment is made, a common feature to all economies is highlighted: the smaller size of the company the lower is the "apparent labor productivity" per person. Most likely the main causes responsible for this effect would be the economy of scale, an improved organization efficiency, and the higher relative use of capital factor and a reduced use of labor factor in the biggest enterprises.

As it is very well known and in general terms, innovation helps enterprises to be more productive and more competitive. In the case of SMEs this is much more important since in these enterprises the more the innovation is able to increase revenues, the more possibilities they will have to grow and consequently to increase their productivity. SMEs highlight in all enquiries however to find barriers to their innovative processes, and these barriers can be one or more of the following: costs, knowledge, market, financing or as simply as the absence of an innovative strategy.

In summary, it can be stated that any increase in the innovation ability of our SMEs will have positive consequences in economical growth and in our countries welfare.

The new vision of innovation

History to understand the process of knowledge conversion into wealth is still very young, though it has already got differentiated steps. The first Oslo Manual creation, published in 1992, started with the analysis of innovation processes in manufacturing sectors, which are mainly based in scientific and technological knowledge, what we call nowadays technological innovation. The Manual included features of technological innovation in service sectors in its edition of 1996, and almost ten years more were needed to the latest edition to incorporate organizational, marketing and business innovations. These types of innovation are raised from a scientific knowledge different than natural sciences, such as humanities or socioeconomics, and they are currently known as "non-technological" innovations. It is nowadays more and more accepted however that technology concept, defined as a technique that has been understood, improved or created with the help of scientific knowledge, is similarly applicable to any type of innovation.

Current economical and financial crisis has quickly and clearly highlighted the need of a new interpretation of what does it mean innovation. An innovation is nothing but a change based in knowledge which is able to generate value. Its final objective is to contribute to economical growth and to the increase of society welfare through the creation and application of any type of knowledge. Thus innovation is not just something related to products, processes and services, as it also includes anything capable of inducing every citizen, either consumer, worker or businessperson, to use knowledge as an economical good.

Under this new innovation vision and particularly in its promotion, design of specific policies is not enough since a whole package of them integrated in what is usually named as innovations strategies is required. There is a variety of responsible political organisms and their actions must necessarily be coordinated through these strategies. Innovation strategy should at least include education policies, industrial policies and public investment programs, to which additional ones would be added when temporarily required.

Though entrepreneurial environment has always occupied a secondary site in previous interpretations of innovation, under this new vision has become critical. This environment includes all institutions, such as society as a whole among them, which were not created for innovation but they are essential for the innovation process. Furthermore, it should be acknowledged that even being important enough the role assigned to them used to be mainly instrumental.

Thus society as a group of citizens is raised to the first level in this new way to perceive innovation. Citizens own knowledge and are the ones who apply it providing an economical sense. They are a privileged agent of the innovation process. Their knowledge, their will to apply it to create value and their habits inducing them to do it, determine the quality and the intensity with which this role is assumed, in such a way that any country will be as innovator as its citizens will be.

There is no doubt however that innovation is still and basically an entrepreneurial phenomenon, since enterprises are in a broad sense the instrument capable of creating economical value, and this is exactly their responsibility. It is also very clear that the first entrepreneurial demonstration in society is the small and medium enterprise, which is the largest in number.

In an innovative country any SME must be also innovative, making the country much more competitive to reach greater levels of welfare. If its citizens are innovative, its SMEs will be too. Innovation strategies should intend that education and training given to young people in the country will allow them to be more innovative and that SMEs they could create were able to develop themselves enough to grow and reach those productivity levels needed to be competitive. This new vision of innovation considers citizens and SMEs as the key agents.

If there were particular aspects characterizing SMEs, these are on the one hand its resources limitations in both staff and materials, and on the other their great diversity derived from both the specific productive sectors they are involved in and their personality coming from the specific number of employees. Their innovation features will be quite different from those of big enterprises, and quite different than those described in the first edition of the Oslo Manual of course. SMEs innovation processes are obviously far from being well understood, but to understand them is an urgent need to the current vision of innovation.

The objective of this Cotec Europa Project is to contribute to this understanding, and it is only a first step among all those we will have to do in the next future. Those results already obtained are described in the following sections.

Innovation in a broad sense for SMEs

As any other enterprise, SMEs are forced to be every day more and more competitive in the current global market. Innovation is a way to achieve it through continuous changes to improve their supply, their behaviour in business, and even to modify their core business. Changes could be minimal or could become radical, but they should always be innovations. From their proper nature SMEs should focus their innovation with a global view anyway, and should keep in mind any possible innovation type as well as every aspect that could help them to be innovative. This is why it can be said that the innovation which better fit SMEs is the "innovation in a broad sense".

Much of what we currently know about innovation is applicable to the innovation in a broad sense concept although there have however been identified important gaps which should be conveniently filled in order to get a complete comprehension

of the innovation process needed by SMEs. One of these gaps is related to the knowledge required by non technological innovations, and its acquisition by the SMEs. Another one, to the management of innovation when there is an absence of a specialized structure, known in production activity environments as "hidden innovation". And third gap is to understand how are the most important qualities for SMEs when deciding, undertaking and being successful with innovation. These three topics are considered later in more detail.

Related to non technological innovations we still do not currently have enough knowledge concerning those processes which would facilitate the preparation of socio-economic sciences and humanities knowledge to make it useful for innovation and particularly in SMEs. In the case of technological innovation, "applied research" is available, and it would be necessary to transfer this concept to this type of sciences environment.

Once assumed the need for this type of applied research, next problem appearing is to define which incentives would make it attractive enough to scientists in these areas, as they have always seen its activity very far from the entrepreneurial and commercial environment.

After this knowledge has been generated, its transfer difficulties should be overcome. This is a problem not even solved for technological innovation, which appears to be more difficult when transfer is directed to SMEs.

Papers published addressing the knowledge needed in non technological innovations and their production and transfer are astonishingly limited, and none of those we know could be suggested to the reader as a reference to deepen in this topic.

Next topic focuses in the management of any innovation when developed in a SME environment, where specialized departments are quite seldom. Assuming that knowledge is affordable to SMEs, it will be needed to understand how it will be assimilated by this type of enterprise and more specifically which are the factors making some of the SMEs more open to take advantage of these innovative activities than others.

An additional area which needs a much better comprehension is the way in which enterprise groups of people involved in the innovative activities are operating. Due

to the company small size, these groups shall necessarily be provisional and non official, and will have to coordinate and share duties with the rest of the enterprise.

Finally and as it happens in every innovation type, it is necessary to understand which are the key agents of the process, especially when the intention is to stimulate SMEs innovation through promotion policies.

For the last few years all these reasons have justified the existing concern to understand why it is so unusual in many SMEs to systematically draw up a plan for new products, and that very few of these companies have introduced a R&D department in their organization even though they have undertaken the development of products, processes and services. It is common to find in these enterprises that knowledge required for innovation lies in external sources (suppliers, customers, consultants, etc.), and it is usually acquired incorporated in new products, machinery or materials, as well as through the recruitment of specialized staff with excellent levels of training and experience. The acquisition of this knowledge quite often requires the interaction with external sources, getting involved in learning processes, and setting out some degree of absorption capacity, i.e., the ability to integrate and utilize knowledge generated by others. Knowledge acquired from experience through processes of learning by doing, by using, or of trial and error, has also been perceived as important to these companies competitiveness. This knowledge both tacit and explicit is incorporated to the working rules and standards generally accepted by the staff. If knowledge type is considered in the case of these enterprises sectors, knowledge related to marketing, logistics, organization and design is viewed as important or more than technological knowledge.

In summary, these works highlight the importance of having a collection of abilities which allow enterprises to reconfigure and convert existing knowledge and technologies to develop new products y processes, both internally and externally, much more than the importance of knowledge generation. These firms are characterized by a limited or even non existent R&D capacity, but they count with other types of resources and abilities to support innovation which compensate for that lack of R&D. These resources include different knowledge types, both explicit (design, new products specifications, technical and engineering knowledge, etc.) and implicit linked to the experience and to those processes of learning by doing

and learning by using. With these abilities companies might access, adapt, integrate and use the external knowledge with the internal one.

Studies concerning innovation in medium and low technology sectors are mostly based however in the exploitation of already existing data, and are very few the ones which have deepen in the innovation process, in aspects such as how does innovation occur in these enterprises, or how their environment is affecting the innovation process. Similar conclusions can be also found in papers about innovation in SMEs. As an example from the United Kingdom bibliography on innovation in SMEs, it can be concluded that innovation process in these enterprises is not clear yet. In another paper studying the ability to innovate of small companies, the authors indicate that although innovation process has been abundantly studied, a majority of them were focused in new products success factors in big and medium enterprises, and innovation in small companies and the abilities required to stimulate them into innovation processes has been investigated very little. Better information concerning this topic is available in Appendix 1, which includes executive summary and bibliography of project PILOT, Policy and Innovation in Low Tech, financed by the European Commission.

The remaining part of this document has been dedicated to the third topic, i.e., the one whose aim is to understand and assess the important qualities for SMEs when they decide, undertake and are successful in innovation. This is a especially important topic since it provides the tool to distinguish SMEs by their proneness and ability to innovate. The adequate evaluation of these characteristics, will allow on the one hand the SMEs feeling the need to innovate to design their strategies to make it real, and on the other will allow Public Administrations to position potential public policies.

A model to assess propensity and abilities of SMEs to innovate

This model is directed to identify the most important qualities in any SME when deciding, undertaking and being successful with innovation. To do that, a network in which decisions and innovative processes are supported is proposed. This network is also useful to assess the importance of each component when determining company's behaviour with innovation.

To do this, it has been assumed that in any business and although each activity has its own peculiarities, it is bound first to choose a path, second to decide resources assignment, and third to control both partial and final results. Innovation is not indifferent to these obligations, and its particular features are described below.

A SME which has opted to innovation needs a company culture assigning a great value to the ability to undertake new actions and to assume the associated personal and entrepreneurial risks. This is what is called "innovation culture". This culture is mainly shown by the implicit or explicit existence of an "innovation strategy", which is settled down in an "innovation planning".

When a SME assigns resources to innovation, i.e., it has recognized it as an operation, "media and people" dedicated either total or partially to innovation are needed, as well as "processes" more or less defined and a minimum of "tools" for this management are available.

From its proper nature innovation involves high risks, as failure likelihood is high and it commonly spends significant resources. A sustainable innovation is only possible if there is persevering conviction in the enterprise that innovations as a whole provide benefits. This induces results control as a very important aspect for innovation. Therefore innovation must be appreciated since SMEs need to be clearly and permanently conscious that they are getting value from this risky process. This is why the company should evaluate how innovation is contributing to improve the "available products and services", the "internal processes efficiency", and the Company balance through its results "capitalization".

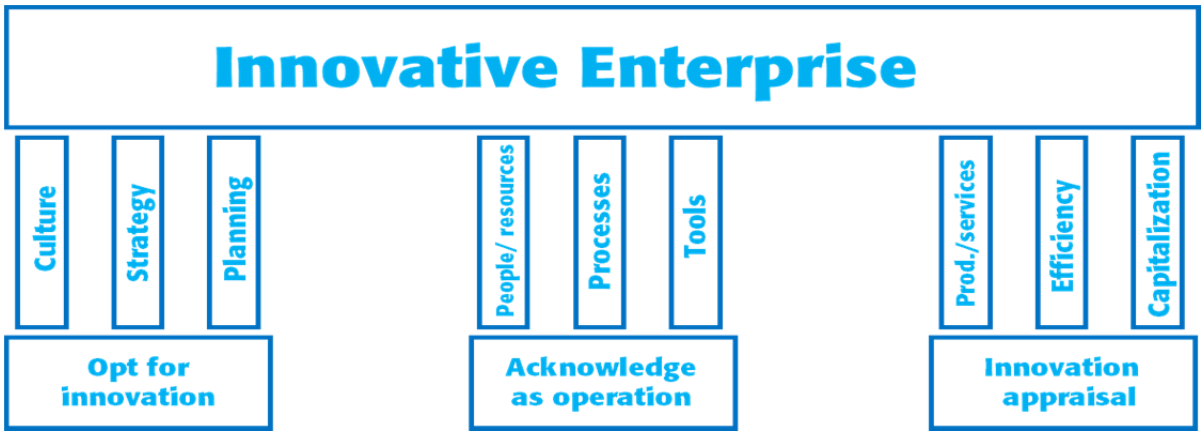


Figure 1.- Duties supporting the enterprise innovation attitude
Source: Cotec

In figure 1, duties sustaining a SME innovative attitude are presented. There three foundations corresponding to the obligation to opt, the one to operate and the one to appreciate. Over each foundation there are three pillars representing the aspects in which each obligation is shown. Each aspect should be present in the innovative enterprise, though dedication to each one was highly different. Formality degree, applied resources and commitment degree assumed by the company will determine its innovation manners and consistency.

To Opt for innovation

Pillars defined in "To Opt for innovation" are supporting the innovation attitude, and determine the proneness of the enterprise to innovate. As it was already said, they are innovation culture, innovation strategy and planning of innovation activities.

Culture

The innovative culture of an enterprise involves the existence of a collection of values, habits and knowledge, boosted from top management and shared among all employees, who will facilitate innovation activities development and success.

This is settled down in a participatory direction style which is able to induce confidence, collaboration, mutual learning and personal improvement. Participatory direction makes collaboration among counterparts easier in order to set up the objectives and decision making, getting them committed and increasing with all that their motivation. All of it would contribute to reach predicted results.

Innovative projects involve many activities performed by a team, with the collaboration of people of many different profiles and origins, which could become stronger if mutual confidence is established to facilitate the exchange of experiences. Innovation also requires abilities and knowledge in a great variety of aspects which should be included in the innovative enterprise training plan. The most entrepreneurial employees should get involved to acquire them.

Innovative culture also requires a flexible assignment of responsibilities in a way that employees were able to participate in those initiatives which are more adequate to their abilities. Innovative person career in the enterprise should be consolidated on diverse experiences coming from responsibilities in different areas from the company, as well as from collaboration with customers and suppliers, background that would provide her/him a wider vision and the possibility of

contributing with new ideas in quite different topics, many of them would not have to be related to her/his current activities. In this way, it is convenient to highlight the importance that enterprise culture promotes an internal open communication, and provides a good connection between different enterprise areas and employees with knowledge, information and data able to help in the solution of problems during the innovation process.

The enhancement of creativity through the whole organization should precisely be one of the most visible consequences of an innovative culture. It is important that this culture appreciates those factors which appear to be critical to stimulate or motivate the generation of new ideas or innovative initiatives, and simultaneously removes all those other factors involved in obstructing them from rising. One of the biggest barriers preventing creativity from flourish is the absence of time to think and full time dedication to tasks highly focused to the same knowledge area.

Culture in an innovative enterprise should also support itself in policies of recognition and rewarding of those achievements aligned with the innovation strategy, as well as tolerance to innovation projects potential failures policies coming from poorly foreseeable circumstances.

Innovation strategy

The innovation strategy is just one more aspect of the global strategy of the enterprise, and it is indicating where the company wants to innovate and how does it want to do it. It defines products, processes and services lines, and the organization and commercial practices which will be involved in innovation as well as the intensity of the changes and the schedule to happen.

Moreover, the following are possibilities for evaluation and decision in the SME innovation strategy: subcontracting of R&D, collaboration with knowledge providing organizations o with agents supporting innovation, purchase of industrial or intellectual property rights, and of course to foster the internal technological sources.

Innovation strategy should necessarily be dynamic and flexible, and at the same time it should be maintained with time. Company environment conditions changes, in particular related to the market, could be suggesting redeployments in the

innovation strategy to take the advantage from opportunities or to deal with new threatens, but it should not disappear by any means.

Planning

Planning process begins when ideas are generated following the strategic guidance, continues with their appreciation and a selection of the most promising, and finalizes with projects formulation.

Innovation planning is a process which should necessarily and permanently be open to collect any dynamic redeployment in the strategy, and to absorb any new idea which depending on how was it appreciated could have an influence on the schedule of other projects that will be prioritized or delayed or even cancelled, as convenient.

Projects formulation should set up objectives, define tasks with assignment of economical and human resources, and time schedules. It is essential that in innovation projects, and particularly in the R&D ones but also all the others, intermediate milestones are included to allow project reorientation if partial results obtained or difficulties and opportunities identified through the process would recommend it.

Innovation as an Operation

Innovation must be a business operation in a similar way as marketing, logistics, production or sales. Unlike these ones however it is an operation which involves the whole enterprise. As any other company operation, innovation is developed from processes, people, media and tools.

Innovation processes

Innovation processes are many and diverse. Some of them have the objective of generating and acquiring new knowledge. Knowledge generation, i.e., R&D, should be approached if the knowledge required by the innovation is not available in the market in the most adequate shape. Under a certain frequency it will be more convenient to externally contract this activity, and then it will be named external R&D. The acquisition of knowledge already existing in the market offers many possibilities. Sometimes it will be incorporated to equipment goods or to partially manufactured products. Some others it will be about buying patents, licenses or

know-how. These latest cases will require simultaneous legal procedures to formalize the property of the acquired knowledge.

Other innovation processes mainly search for the industrialization or the marketing of the innovation. Through these processes, engineering will be developed and when needed pre-series and launch assays will be done, and staff will be trained in the specificities of the new products or services. The possibility of using external resources also exists in this case, getting the process significantly complicated.

People and media

Enterprises can only innovate if they count on the adequate people and media. As being the base of any innovation, knowledge just belong to people thus turning the enterprise employees into a key factor of innovation. To get the adequate people and ensure their efficiency is an essential step for the innovative company. Thus enterprise policies for hiring and attracting, for training, to motivate, of evaluation and reward, and withholding of qualified staff, do have a direct effect in innovation.

Management tools

Management Tools are more or less sophisticated methodologies which help in the control and improvement of entrepreneurial processes. There are tools for a quite general use, and other ones specialized in any particular operation type, and innovation management can benefit from all of them. Strategy, planning, project control and staff management could benefit from those tools for general use, and there are tools specific for innovation activities, such as those directed to technological vigilance or to define the features of future products. Market offers a wide range of tools anyway, and many of them are management methods of a really easy application.

Appreciation of innovation

Sustainable innovation requires from the enterprise to explicitly identify the generated value by its different innovations, as a way to support continuity and improvement of its manner to implement innovation. Value generated through innovations becomes apparent in one or more of the following aspects: new goods or services commercialization, operation and processes efficiency, and results and experiences capitalization, i.e., the increase of intangible assets.

Appreciation of innovation is verified through differentiated accounting of the created value, thus being necessary to realize its effects and measure them. Analytical accounting is the most adequate instrument to appreciate innovation.

In addition, sustainability of innovation also requires from the enterprise to share this appreciation with the whole company and with its environment. All successful achievements and derived opportunities should be shared with all groups involved direct or indirectly internally. It is also important that the company shares its innovation appreciation with its shareholders, its customers, its employees and its suppliers, with the education and knowledge generation centres of its local community, as well as with other potentially collaborator enterprises in its activity fields.

New products (goods or services) commercialization

New or improved goods or services commercialization as well as the adoption of new marketing methods have a common final effect if successful, and this is an increase in company revenues which can be considered a result of innovation.

The most significant indicator of these innovations appreciation is therefore the increase in sales attributable to them. This indicator could be split as desired, e.g., the increase in revenues from a particular market could be distinguished from the rest, or the growth in sales coming from the most radical innovations, or the effect of improvements in the enterprise income.

It is common to resort to financial tools to assess the effect of innovative projects, and these tools will provide different ratios which will help to improve these operations. A measurement of the company innovation vitality is the rate of sales due to new or improved products, processes or services in a particular time period which usually corresponds to three or four years.

An increase in efficiency

Most clear consequence of new or improved productive, commercial or managerial processes is costs reduction, making enterprise more productive. Analytical accounting is again the most adequate methodology to appreciate these innovations, which could induce costs reductions through a lower use in production factors, or a decrease in basic materials costs or in partially manufactured products required in production.

Innovation value capitalization

Enterprises should develop their capacity to capture the intangible value of their innovations, another facet of appreciation which is added to the potential increase in revenues or reduction in costs. This capitalization means a rise in company assets and it is mainly coming from two reasons:

- Incorporation of new knowledge and experience which was acquired during development of innovations and will increase the goodwill.
- Appropriation of differential results from innovations, both through the industrial and intellectual property rights registration, and a better appreciation of the company image.

An increase in knowledge and experience will allow the enterprise to tackle new innovation projects with a better likelihood of success. Both knowledge and experience should be transmitted to those areas in the organization which are better prepared to assimilate and utilize them, in order to reach this objective. Company culture will be more and more adequate to support innovation. Both success and mistakes experiences, and even failures, will always be a source of inspiration for potentially more suitable new strategies and policies.

Model validation

This model is based in a previous model, which was designed to understand how big companies behave with non technological innovations and was validated using an inquiry of 50 questions. Each question was designed to be answered showing approval or disagreement in a scale between zero and one hundred in a session using similar techniques to the current ones utilized in the Excellence EFQM (European Foundation for Quality Management) model.

Thirteen big Spanish and innovative enterprises completed the questionnaire, what provided a matrix of thirteen per fifty elements with a value between zero and one hundred. This matrix was analyzed through statistical software SPSS, and allowed to detect some redundancies as well as define clusters. Results obtained showed a very accurate image of the innovation reality of the enterprises in the sample, what

was considered a reasonable confirmation of the hypothesis used to support the model.

Building a taxonomy of innovative SMEs

A detailed analysis of redundancies found among big enterprises responses allowed to significantly simplify the questionnaire on the one hand, and on the other it provided arguments to start a project directed to adapt both model and questionnaire to small and medium enterprises. It was then designed a questionnaire of a very easy completion to allow any company to provide the necessary information to evaluate its innovation ability. This questionnaire should be shorter and it should require responses like Yes or No making reference to aspects that the entrepreneur could answer just based on her/his own perception of the reality of the company. These two hypothesis had to obviously be carefully validated, thus being necessary to submit this questionnaire to an important number of enterprises.

This was essentially an easy way to weigh up the robustness of applying each model pillar to the company tested. With this information it should be possible to evaluate the consistency of the foundations supporting the pillars, and consequently provide any enterprise with a relative value of its involvement degree when taking the option for innovation, the soundness of the operations facilitating the innovative processes, and finally to estimate the importance attributed to its achievements appreciation.

The absence of references was obviously preventing us from a priori attributing a meaning to the absolute values collected from the questionnaires. It was however possible to progress in the understanding of the innovative ability of each enterprise through a comparison of its responses with those corresponding to the remaining sample. Moreover, it should be possible to group the companies based on the proximity of their responses, and also to understand the features of each identified group. This was the way used to reach the innovative ability taxonomy of Spanish SMEs, which will be described below.

Questionnaire

First version of a simplified questionnaire was run with 45 selected SMEs, and it was proven the completion easiness and the quality of the collected information.

This enhanced us to repeat the inquiry to additional enterprises in subsequent and varied waves until more than one thousand companies were reached, which included a great variety of enterprises, by geographical area and by sector. Results showed not just the goodness of the method but also an extraordinary convergence in the "cluster analysis" subsequently performed. Questionnaire has of course incorporated some control questions in order to detect inconsistencies in the whole pack responses of each company, and the number of questionnaires rejected for this reason was very low.

Questions in the questionnaire are basically referred to:

- Top management concern to ensure that innovation information flows in the company and in its environment.
- Frequency with which innovation is raised in top management meetings.
- Relationship with customers, suppliers and tecghnological community.
- Staff assigned accountability.
- Importance given to innovation in the enterprise strategic objectives.
- Enterprise budget structure.
- Knowledge concerning innovation promotion public support.
- Existence of systematic processes.
- External relationship.
- Accountancy practices.
- Concern about the Enterprise image.

Sample features

Final sample of the inquiry involve a thousand enterprises with between 6 and 250 employees from all Spanish Autonomic Communities and belonging to many different sectors, both services and manufacturing. Following figures show some of the most relevant features of the companies addressed.

A majority of enterprises, almost a half, have between 11 and 25 employees, and those with between 26 and 50 employees involve approximately one fourth. All the rest distributes more or less uniformly, except the smallest ones which are double than the biggest ones.

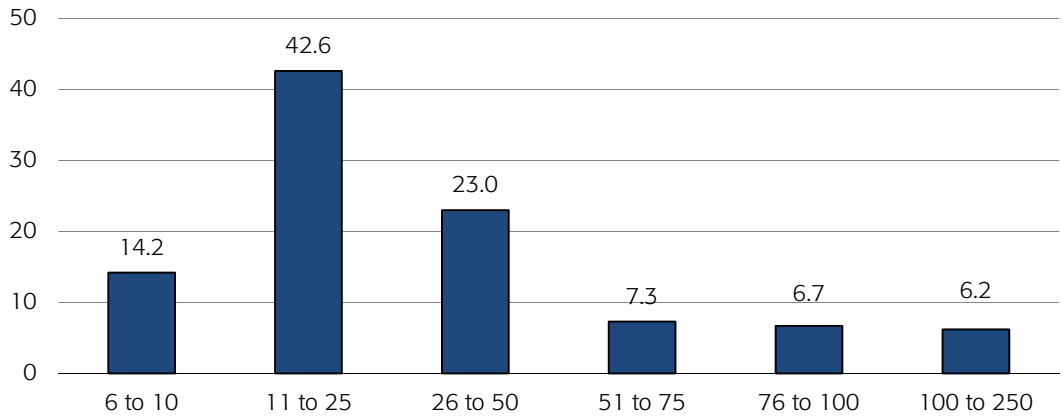


Figure 2. Enterprises per number of employees
Source: Own preparation

Relative distribution by sectors in the study sample appears to approximately reflect the general distribution of Spanish SMEs. The most frequent sectors are those in services and a poorly homogeneous group with construction, materials and a variety of industries. Both contribute with more than 30% each to the sample. Food and chemicals represent around 10% each. One fifth of the sample belongs to more or less traditional sectors with a certain degree of potential innovation. The most technological enterprises are included in machinery, electricity and electronics sectors which as a whole represent the remaining 10%.

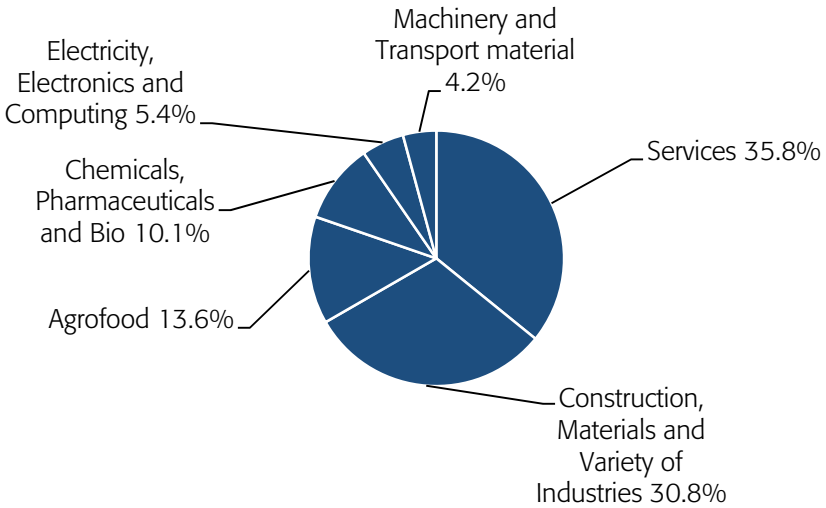


Figure 3. Enterprises per economic activity
Source: Own preparation

Another feature of the sample is the age of the enterprises. The most important group joints together the companies of less than 10 years of age, and represents one fourth of the sample. Only seven out of one hundred SMEs were created before 1960, and a 20% is more than 30 years of life.

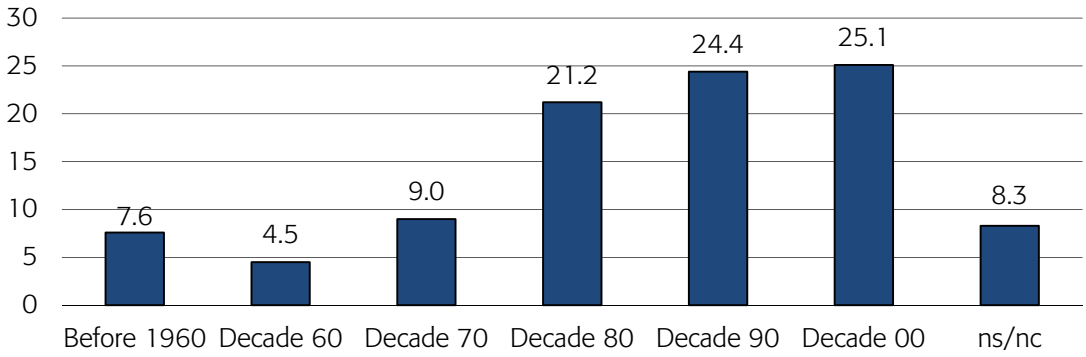


Figure 4. Enterprises per creation period
Source: Own preparation

Considering the export capacity, almost 70% does not have it at all, and just a 6% of companies dedicate more than half of its invoicing to export. It could be stated that for less than one third of the companies international markets are important in a certain degree.

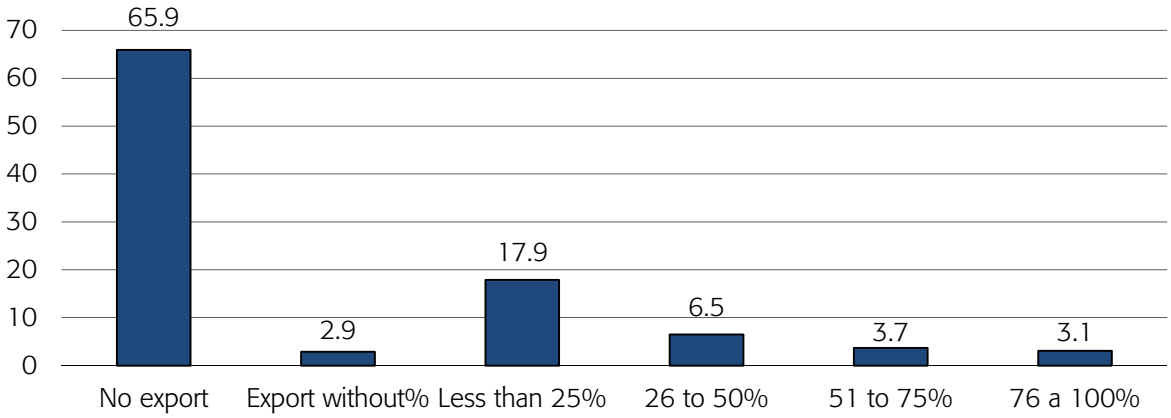


Figure 5. Enterprises per their export size
Source: Own preparation

It is obvious that this sample was not randomized enough as enterprises, sectors and geographic areas were selected to find out about the robustness of the model,

and there was no intention to obtain a representative expression of the Spanish reality at this step.

Spanish SMEs taxonomy

In agreement with the model described, it is possible to classify enterprises by using the three variables which represent the importance they give to each one of the innovation activity foundations: to Opt, to Operate and to Appreciate. Questions of the inquiry could be assigned to one of these variables and with their responses an index to each one of them was generated. These indexes would represent the solidness of each foundation in each enterprise. These indexes are standardized to one, and this value would represent the highest possible soundness.

Thus each company is characterized by a point in a three-dimensional space defined by the three selected variables. Next step requires finding out the spatial distribution of these points to prove if there exist any pattern characterizing groups of enterprises. This is what cluster analysis means, and it is possible thanks to information treatment commercial programs. In this case, SPSS was used and showed that one thousand companies of the sample are grouped in five categories or clusters, and each one is defined by a calculated geometric centre. It was observed that each enterprise is closer to the centre of its cluster than to the centre of the other clusters, and that distance between cluster centres is always bigger than the distance between the centre of a cluster and all companies belonging to it. These observations fully supported a classification of enterprises in very well defined categories.

CLUSTER	DISTRIBUTION (%)	TO OPT	TO OPERATE	TO APPRECIATE
No innovation	28	0,27	0,17	0,13
Scarce innovation	30	0,62	0,34	0,28
Image innovation	11	0,58	0,37	0,75
Latent innovation	18	0,84	0,69	0,41
Consistent innovation	13	0,89	0,73	0,91

Figure 6. Clusters centres and enterprise distribution
Source: Own preparation

Figure 6 shows the values of the centres characterizing each cluster. The different indexes values of each foundation, shows how different is the innovation ability of enterprises belonging to the different clusters found,

Figure 6 also shows clusters distribution of the whole sample studied, which is graphically presented in figure 7. If each inquiry wave is represented independently and considering that each wave corresponds to a more homogeneous group of enterprises, it is observed that clusters distribution changes dramatically from a sector to another and among geographic regions. Clusters centres values are however virtually stable.

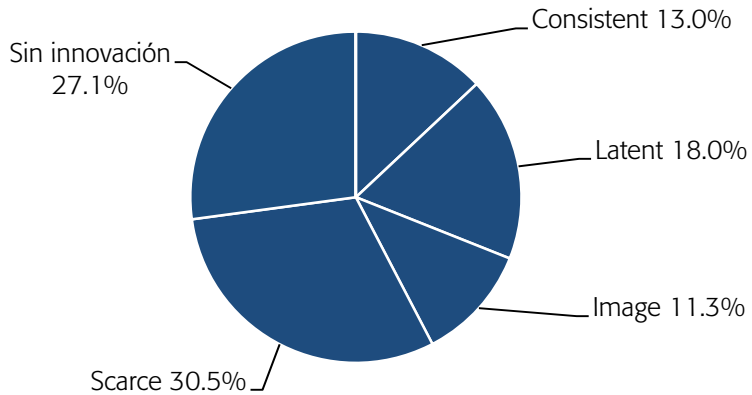


Figure 7. Enterprise distribution in five clusters
Source: Own preparation

Clusters specific features

The values of the variables defining each cluster centre suggested the names given to them, which have already been used in figure 6. First one, "No innovation", contains the companies with practically none innovation activity. Next group of enterprises have a very scarce soundness foundations and was named as "Scarce innovation". The other three clusters are characterized as having at least one of the variables defining the centre with a high value. Enterprises with a high value in appreciation foundation but being scarce for the other two have been named as "Image innovation". Those with a prominent value in foundations to opt and to operate but lower in appreciation have been grouped in the cluster named "Latent innovation". And finally, those with high values in all three foundations are the ones in cluster named "Consistent innovation".

Cluster centres coordinates obtained from the three variables corresponding to the three model foundations are graphically presented below. Another graph for each cluster shows the mean value for each of the nine pillars in the model, as a representation of their soundness.

No innovation cluster

Companies show low values for all variables in this cluster as previously indicated. These enterprises do not support their activity on the innovation foundations, and their competitiveness if they have it is based in other advantages.

Figure 8. Final centre for "no innovation" cluster
Source: Own preparation

Scarce innovation cluster

Enterprises of "scarce innovation" cluster have medium values in the variable "to opt", and low values in the other two. These companies show a certain degree of propensity to innovate, but they have not internalized it in their operations, and they are not concerned about "appreciating" the results from the activities primed by their potential predisposition.

Figure 9. Final centre for "scarce innovation" cluster
Source: Own preparation

Image innovation cluster

Enterprises belonging to this cluster have high values in the "appreciation" variable, medium in "to opt" foundation and low in "to operate" variable. These are companies with significant resources assigned to innovation, but they show a certain predisposition to innovate. They appreciate the results of their innovative activity, i.e., they recognize how important is to make them visible.

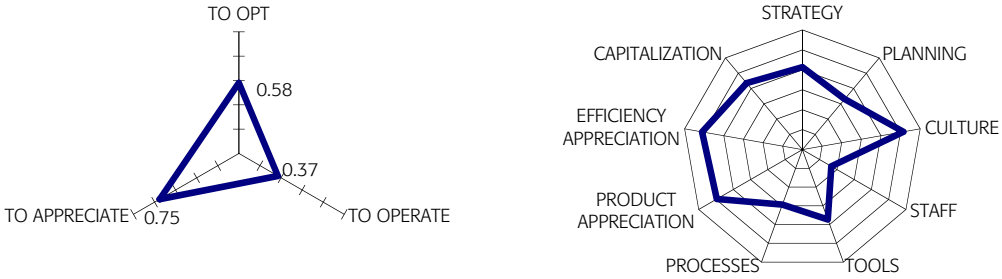


Figure 10. Final centre for "image innovation" cluster
Source: Own preparation

Latent innovation cluster

In this cluster, enterprises have high values for "to opt" and "to operate" variables, though the ones in "appreciation" are low. These companies are convinced of the importance of innovation to create value and they have incorporated it their processes assigning resources, but they are not being able to appreciate their innovation results.

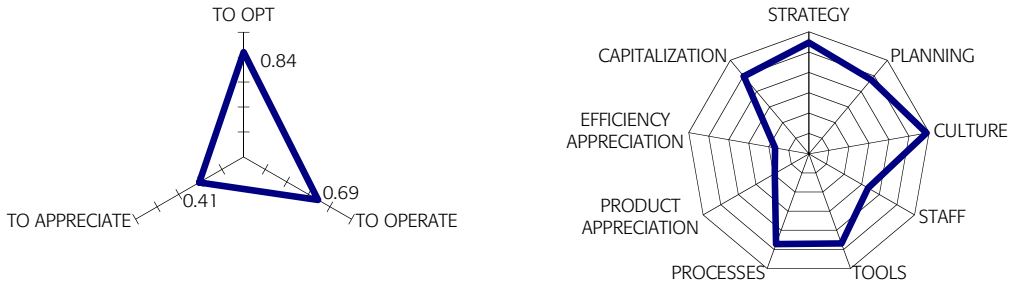


Figure 11. Final centre for "latent innovation" cluster
Source: Own preparation

Consistent innovaron cluster

These enterprises show high values in all three variables. Their foundations are consistent as they take care of all duties demanded by innovation.

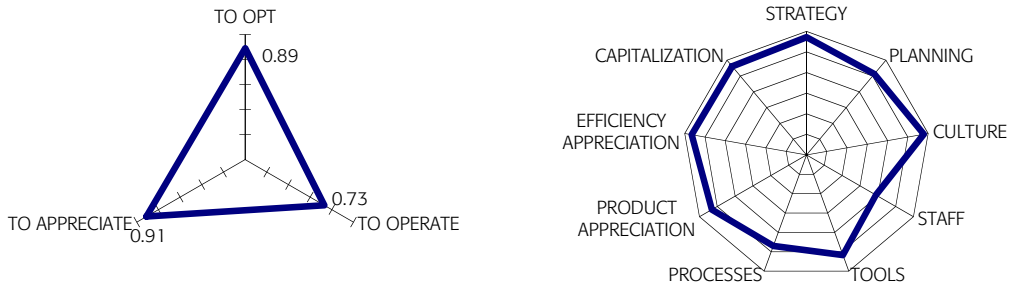
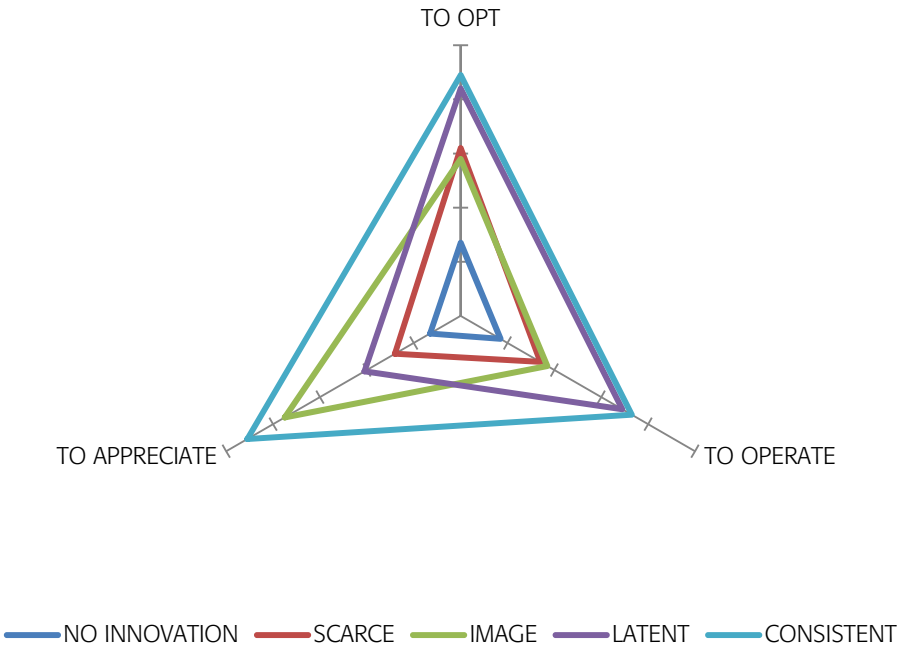


Figure 12. Final centre for "consistent innovation" cluster
Source: Own preparation

Relative position of all clusters

Figure 13 shows all five cluster centres drawn in the same axis in order to facilitate visualization of the great differences in behaviour patterns of the sample Spanish SMEs studied.



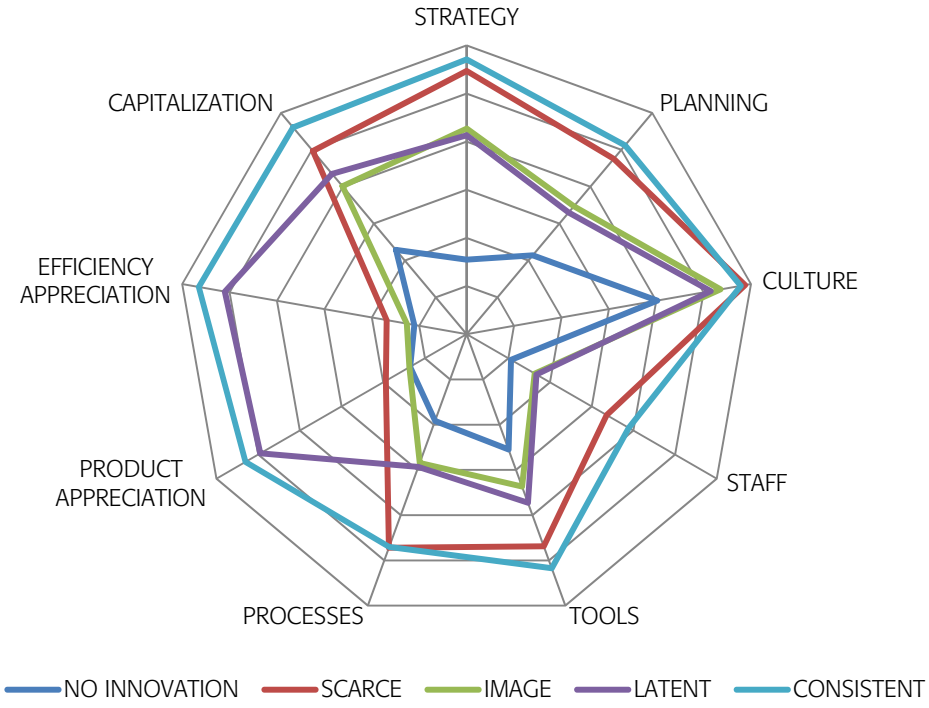


Figure 13. Final centres for all five clusters together
Source: Own preparation

Application of this model to SMEs from Italy and Portugal

Cotec Italy and Cotec Portugal have presented the same questionnaire to a selected Group of SMEs in their country, and results obtained are comparable to those for the Spanish SMEs. As well as for the Spanish case, enterprises selected sample are not representing their country real status, although results are stimulating us to be confident of this tool to know the SMEs innovative reality in our three countries. We will use it for future projects directed to know and help to improve innovation in such an important sector of our economies.

Figures 14 and 15 show a comparison of cluster distribution of the different samples analyzed.

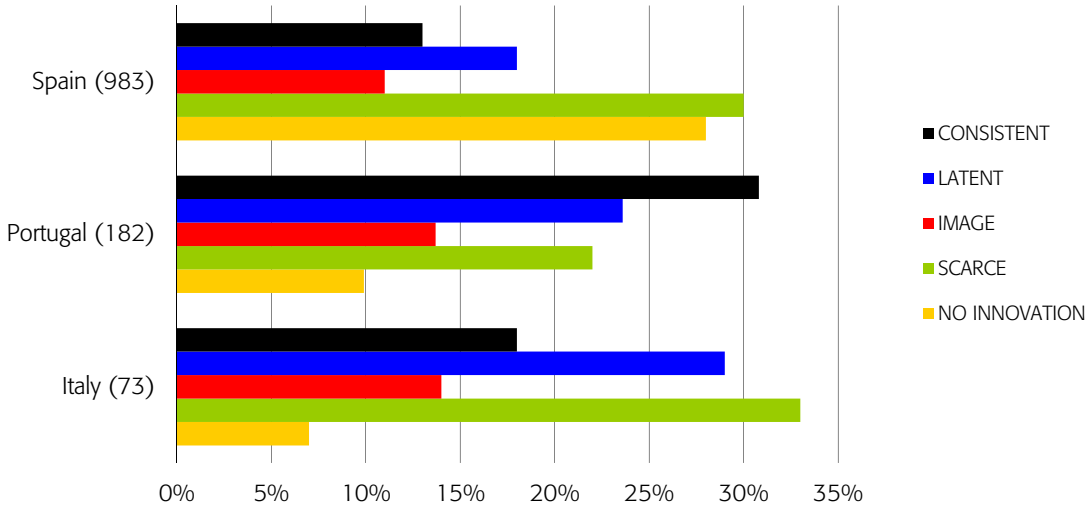


Figura 14. Clusters relative distribution. Samples of the three countries
Source: Own preparation

Figure 14 shows a comparison of clusters distribution of the samples from Italy, Portugal and Spain, and figure 15 shows the observed distributions in the subsequent waves carried out in Spain. It is observed that distribution of Italian and Portuguese samples are quite close to those for Spanish waves.

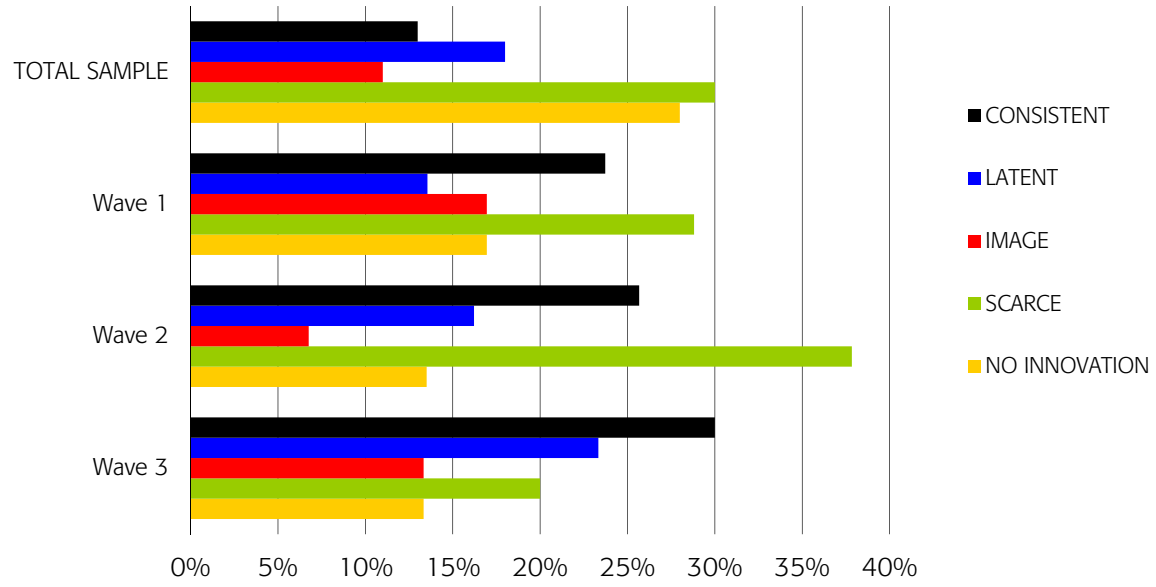


Figura 15. Clusters relative distribution. Whole Spanish sample and several waves
Source: Own preparation

Conclusion of the inquiry results analysis

Surveys have shown the existence of quite different attitudes towards innovation and the comprehension of the innovation process in SMEs. Several recommendations can be suggested from the good and bad practices detected, some of them being quite general and some others being specific for each of the foundations in which every enterprise should support its innovation process.

The aim of these recommendations is to stress behaviours useful to reinforce each foundation, and it will be the enterprise task to determine which ones of these recommendations will be the most helpful to get as far as possible in its innovation attitude.

General recommendations

To know which ones are the enterprise competences (knowledge and modus operandi) providing a competitive advantage

- To take advantage of the enterprise know-how, knowledge and abilities is the most secure way to approach innovation
- New business opportunities will require new competences to be developed either internally or provided by external collaborators
- To know how to collaborate in innovation is a competence *per se*, and it

To know the value ascribed by the market to the enterprise competences

- Innovation success is to get new products, processes and services accepted by the market
- Relationship with customers and market vigilante are key aspects to predict innovation success likelihood

To know the value attributed by the employees to the Enterprise competences and if they assume their importance to innovation

- Employees motivation is critical to the innovative company

- A high assessment of the enterprise competences is a source of motivation
- Employees participation in innovation occurs when they apply their knowledge in a creative manner

To know the value of Enterprise intangibles (goodwill)

- Innovation is a source of intangible assets
- To admit these intangible assets is an additional reason to innovate

To strengthen the option towards innovation

To devote one point in all top management meetings to explore potential changes to improve business

- Thus innovation is integrated in the language and therefore in the culture of the enterprise
- An obligation to propose and justify changes should be assumed by all participants

Minutes of the meetings with suppliers should always include a point concerning supplier suggested novelties and his/her reaction to company demands

- Suppliers are always a source of ideas, and they suggest opportunities based on their good knowledge of the market
- Systematic application of this practice expands innovation concern to the whole company and allows to assess the contribution of every supplier

Minutes of the meetings with customers should always include the novelties requested by the customer and his/her reaction to enterprise suggestions

- Customers not only sanction innovations success but they are a source of new ideas too
- To pay attention to customer suggestions, in addition to cultivate their loyalty is also committing the whole enterprise to the innovation activity

Design and apply procedures to collect ideas from the market useful to improve company products or the offer of new products

- Attendance at fairs and at business association meetings, or reading specialized press, are affordable methods which should be systematically used to watch the market
- Results of this vigilance should be spread throughout the enterprise

Always include in enterprise budget a fix expense for innovation

- Resources assignment is a recognition of the concern about innovation
- Budget preparation should be used to reinforce the concern about innovation throughout the whole enterprise

Ensure that innovative changes are known through the whole company

- Any reason should be used to strengthen innovation culture, and successes always increase company staff motivation
- In the case of having structured communication channels, it is highly convenient that they include a section dedicated to innovation

Always include in enterprise budget a fix expense to reward innovation initiatives from employees

- In our culture, to give a prize is a regular and accepted way to motivate
- Its advantage over other stimulating ways is its public and competitive character
- Su ventaja frente a otras formas de estímulo es su carácter público y competitivo.

To improve the operation of innovation

Keep active a list of innovative actions

- This is the first step to systematically approach innovation

- List objective is to simply collect potentially innovative ideas without the requirement of an excessive formalized process

During budget preparation, consider the innovative action list to provide resources to the ones which better fit in enterprise opportunities

- This is the right time to establish selection criteria and to request a formal management of those selected ideas
- Formal management main objective is to ensure the established selection criteria fulfilment

If it was decided to undertake an innovative action, it should be funded, executed and supervised as any other company action

- Innovation is an operation like others of the enterprise, and its development should be respectful with company culture
- Innovation management nowadays is a highly formalized practice available to any size and sector enterprise

To explore potential sources of public funding for innovation activities keeping in mind that public funds control requires a significant burden

- Public support should never be the reason to undertake innovative actions
- Enterprise could use public support to tackle more ambitious innovative projects, due to their higher risk or to their higher costs

When the intention is to keep an innovation activity, it is necessary to anticipate the creation and implementation of the required methodology to support it.

- Sustained innovation activity requires systematic management procedures to minimize risks, make the most from the experiences and reduce costs
- Quite often methodology supporting innovation activity does not require an exclusively dedicated structure, which could be shared out with other enterprises functions

To keep always in mind that innovation requires continuous staff training

- People are a key factor in the innovation process, as they are the ones assimilating and applying knowledge
- Enterprise budget should include a fix expense for training

To assume that no enterprise has enough abilities to innovate alone and therefore collaboration with other companies and institutions is an obligation

- When planning sustained innovation, opportunities to collaborate with other enterprises or institutions should always be considered
- Collaboration requires a significant internal ability to innovate and manage in the relationship with other organizations

To improve innovation value surveillance

To include innovation in the enterprise accounting as any other operation

- Accounting is the basic information source to any operation management
- Accounting detail should be enough to distinguish expenses and revenues derived from each innovation type: product, productive process, commercial process, service, etc.

Keep into account that innovation is a source of intangible assets to the enterprise (image, patents, knowledge, technology, etc.)

- Company balance should update the value of intangibles generated by innovation activities
- Those intangibles and their variations should be included in every enterprise commercial and communication information

To take advantage of innovation tax incentives acknowledged in Spanish legislation

- Spanish tax system is specially generous with innovation

- A simple accounting is enough to justify tax incentives given by Spanish legislation

Ensure that shareholders, employees, customers and suppliers visualize those benefits yielded by the innovation activity to the company

- It should not be forgotten that innovation activity is risky *per se*, though it is obvious that successes compensate failures more than enough
- Any communication channel with those interested in the enterprise should provide adequate information of the innovation activity balance

Take advantage of the innovative image of the company as a way to gain market, financing and talented people

- Society already perceives innovative enterprise as a generator of qualified employment, as a source of benefits and as a provider of attractive products
- To show an image of an enterprise with innovative capacity is always profitable

To highlight the enterprise innovative ability when applying to public tenders

- Spanish legislation recognizes public procurement technological innovation benefits
- Companies should take advantage of their innovative capacity as a marketing tool when applying to public tenders

To keep in mind that both successes and failures of innovative experiences constitute a source of knowledge for future innovations

- Innovation activity is a continuous source of knowledge, as difficulties and failures could also be a good training
- Failure penalization is not part of the innovative culture, as fear to failure inhibits people creativity

ANEXO 1

PILOT

Policy and Innovation in Low-Tech

Funded under the Key Action
'Improving the Socio-economic Knowledge Base' of FP5
DG Research
European Commission
Issued in
January 2006

I. EXECUTIVE SUMMARY

In the movement towards a knowledge based society in the European Union, the competence to generate, use and absorb new knowledge is increasingly viewed as critical for economic success and societal development. Against this background, the conventional wisdom sees high-tech, research-intensive and science-based industries as the key drivers of future economic prosperity. Such industries are regarded as the main source of highly sophisticated products that are not easily imitated elsewhere and, therefore, the policy conclusion is that high-cost industrialised countries should concentrate their efforts on promoting these industries. In this scenario, non-research intensive, so-called low-tech and medium-low-tech (LMT) industries are deemed to offer little to enhance prospects for future growth, and as a result, they receive less explicit political attention and support. LMT sectors comprise for the most part mature industries such as the manufacture of household appliances, the food industry, the paper and print industry, the wood and furniture industry, the manufacture of metal products or the manufacture of simple plastic products.

Such sectors were the focus of the PILOT project, and a critique of the reasoning just outlined and of the unfavourable policy consequences that followed were its starting point. The main objective of the project has been to establish the role of low-tech and medium-low-tech industries in the knowledge based economy both empirically and conceptually, and to determine what part they played in innovativeness and innovation within countries and regions. Hence, the project's thread was twofold from the very beginning, with an intention to contribute to both innovation research and the knowledge base for innovation policy.

Since early 2003, the national research teams in the project have conducted case studies on LMT companies in eleven European countries (cf. section III 3.), on the value chains these firms are part of, on their regional networks (cf. section III 4.), and on the policies that impact on the firms and on LMT sectors in general (cf. sections III 5. and 4.). The results of this research have been thoroughly discussed in various project workshops. The analysis of LMT related policies was achieved through two levels of research activity. One level was that of policy makers in various policy institutions including industrial and development agencies, industry association, trades unions, municipal and regional authorities, national governments and EU agencies. Secondly, the policy research incorporated the results from the

case studies in which decision-makers in the companies were asked to identify the nature and level of policies that affect their firms and industries most significantly.

This work has been complemented by quantitative analysis of the contributions of nonresearch- intensive industries to employment, growth and innovation in OECD countries (cf. section III 2.). In addition, conceptual issues were tackled. Among the results of the latter work are a suggested taxonomy that is better suited to catch the fundamental phenomena of the knowledge based economy than the established industrial classification system (III 1.) and the concept of "innovation enabling capabilities" which was designed to grasp preconditions of innovativeness on the level of an organisation (III 3.).

The project consortium comprised eleven research teams from nine European countries (Austria, Finland, Germany, Ireland, Italy, Norway, Poland, Spain and Sweden). The work was co-ordinated by the University of Dortmund, Chair of Industrial and Economic Sociology (UDTM.ESS.TS). The following points provide a brief summary of the project's main results.

Much growth and employment in OECD countries still emanate from LMT industries, and LMT companies are relevant sources of innovations in the economy (cf. III 2.).

LMT industries in the OECD countries employ many more people than high-tech industries. Moreover, many firms in these industries are innovative and knowledge intensive without, by definition, engaging in R&D to any great extent. Thus, they provide a striking challenge to currently held notions about the sources of future industrial growth. Our analysis suggests that while new sectors emerge within the economy, and some sectors disappear, this does not account for the processes of growth which actually occur across the OECD. The growth trajectories of the advanced economies seem to rest as much on such sectors as engineering, food, wood products, and vehicles and so on, as they do on such sectors as ICT or biotech. Medium-low and low-tech industries have persisted over the past decades despite the claims that we are undergoing a kind of structural revolution.

In terms of industrial structure, change and growth, there is substantial variation across OECD countries when it comes to the shares of output and employment accounted for by high-tech industries – there are quite different sectoral mixes that persist over time. In this context we found no evidence of any direct linkage

between technological intensity of the industrial structure and economic growth at the level of the economy as a whole. There is no simple relationship to the effect that the high-tech economies are also the high growth economies. This suggests that different economies can follow different routes to economic growth. 14 Countries play different roles in an economic system which is differentiated at the international level, and in which there is a division of labour among the highly developed economies.

These research findings show that growth is primarily based not on the creation of new sectors but on the internal transformation of sectors that already exist. Overemphasising the role of high-tech activities ignores this major dimension of change in advanced economies. As a corollary, in order to ensure continued future growth prospects for advanced economies, policy-makers need to focus on the processes of innovation and creativity in firms in all sectors, not just high-tech firms.

Innovation policy can be more effective when it is based on a more comprehensive understanding of the relationship between R&D and innovation (cf. III 1.).

The project has tried to address the issue of the appropriateness of currently used innovation indicators and the conceptualisation of innovation on which they are based. We argue that improvements can be made in their construction and use.

More generally, our findings on what goes on at the micro level of the firm aggregate to raise serious questions about the assumed relationship between R&D and innovation at the macro level of a country or region. The OECD classification of four industry clusters (high-tech, medium-high-tech, medium-low-tech, low-tech) is often falsely used to identify innovative and, hence, "relevant" sectors with the implicit understanding that high-tech is by definition innovative and low-tech is by definition not. Based on such a view, enormous innovation potentials escape attention. There are very many activities which may be classified as creative and innovative but which normally are not identified like that, for example architecture, software production, some consultancy and some restaurant work. To the extent that products are new, one can argue that they should be considered as innovations. As admitted in the Oslo Manual such innovations, which have no clear "technological height", are difficult to handle and are thus excluded from consideration.

Our research results, as reported in Sections III 1. to 5., suggest that as an alternative to – better: in addition to – R&D expenditures, analysts must use other indicators of innovativeness and of the general level of technology in an economy. Firms may be classified according to their:

- R&D intensity;

- design intensity;

- technological intensity;

- skill intensity (human capital orientation);

- innovation intensity;

- organisational innovativeness.

The basic assumption is that these indicators together will capture the bulk of creativity, explaining successful firms and industries and showing the variety in all economic sectors. Thus we argue that the adoption of a family of indicators rather than a composite indicator is a more appropriate way to improve on available taxonomies.

Innovativeness is based on a particular enabling conFiguretion of resources that a company possesses rather than on excellence in R&D alone (cf. III 3.).

What are the preconditions for innovativeness in general and in LMT companies in particular? PILOT research shows that R&D in the established sense is only one and not necessarily the most important prerequisite for the innovativeness of an *economy*. Furthermore, there are very many highly innovative *organisations* that are not engaged in R&D at all. Drawing on our case study research and the discussion in management sociology and economics on dynamic capabilities, the concept of "innovation enabling capabilities" (IEC) has been introduced. It is composed of the two dimensions of transformative and conFiguretional capabilities. In the former case, the focus is on the enduring ability of an organisation to transform globally available general knowledge into locally specific knowledge and competences, while the latter case focuses on the enduring ability to synthesise novelty by creating new conFiguretions of established knowledge, artefacts and actors.

The IEC concept aims at analysing the facilitating mechanisms and interdependencies between available resources and innovation outcomes of diverse kinds. There is, of course, a policy dimension too. The prevailing R&D-focused innovation policy instruments fail to address the deeper concerns and needs posed by the innovation activities of LMT companies. This is obviously of concern for the firms themselves that do not find sufficient support in the innovation policy system, but it is equally serious for policy makers in their attempts to increase the overall level of innovative activity in the economy.

With the IEC concept we introduce a tool that helps to identify organisational and cognitive preconditions (and deficits) for innovativeness on the level of an organisation and, thus, also helps to identify levers for sustainable innovation policy measures. How can firms be encouraged to build up innovation capabilities? What roles could different actors play? How and at what level can the development of transformative and conFiguretional capabilities be supported?

Organisation practices – knowledge management and personnel policy in particular – play a vital role for competitiveness and innovativeness of LMT companies (cf. III 3.).

Contradicting another stereotype, PILOT research reveals that there is a variety of skill levels and forms of work organisation both among and within LMT firms in a range of sectors, rather than simply the low-skill, hierarchical model that is often assumed. There are indeed examples of a Taylorist regime but there are also more participative forms of work organisation with a low level of division of labour, flat hierarchies and a rather high overall qualification level.

It is not possible to identify a clear trend for the near future. The companies investigated during the PILOT project seem to follow one of two contradictory strategies. The first entails a (further) deskilling of the workforce in the immediate production process together with a concentration of competence at the white collar level (including engineers). The second strategy is directed at a general improvement of skills and qualifications.

The picture in regard to the use of advanced machinery is also complicated. We have found companies that deploy – and in few cases even develop – highly sophisticated machinery and process technologies, as well as those which still draw to a great extent on traditional manual labour.

Notwithstanding the vast variety of characteristics, structures and problems covered by the term "LMT company", some general conclusions may be drawn on the basis of the case study analyses within PILOT. In many LMT companies, the bundle of skills workers need to possess is changing; craft based competences and skills are frequently (though not universally) becoming less important or obsolete while at the same time the ability to operate computer controlled machines is becoming more important. Currently, however, there is an absence of the provision of this type of hybrid qualification, a lacuna that contributes to recruitment problems. The lack of tailor-made curricula by education and training providers to address the gap in "crossbreed" qualifications exacerbates this problem.

In terms of policy, there is a need to examine ways to assist in providing access to the delivery of appropriate curricula either in-house or through some other mechanism to LMT firms. Those employees currently not usually participating in such further vocational training should be targeted. Perhaps especially in the first years of employment – as training in-house might represent a significant drain on the company – financial aid from the state or public agencies would facilitate the hiring and integration of more workers, especially young people.

Network relations between companies and supportive social networks on a regional level are of great and growing importance as resources for firm capabilities (cf. III 4.).

Network embeddedness in various forms is becoming increasingly important for the capacity of LMT industries to act, given the growing challenges of the world market and globalisation. For example, cooperation in delivering more complex products and services to the market can be a very useful means to reinforce the position of LMT companies in general and of small or medium sized ones in particular.

These kinds of processes cannot be simply planned from above, but they need policies, at least, to ease the start-up process and increase the chance of long run sustainability. Experience from the PILOT project (and others) shows that the presence of a dense network of local institutions favouring knowledge circulation can facilitate these processes. This does not imply that the only scale for circulating knowledge among lowtech and medium-low-tech SMEs is the local or national. There are also examples of international circulation. The point is that there is a big difference as to whether the transfer comes from within a corporate scheme, from

within a sub-supplier relationship, through taking advantage of institutional aid, or because of a cooperative scheme. In the last two cases the capacity of low-tech and medium-low-tech SMEs to exploit knowledge resources on their own is likely to develop with time and it is probable that some of this knowledge will spill over to other firms.

The policy problem is, therefore, to support building innovation-enabling capabilities for these companies to access knowledge resources in a critical and selective way. Such policies can also be implemented through networking. Shared facilities for product innovation or a policy coalition lobbying for particular policies, for instance specific vocational policies to strengthen the labour market, are examples of this.

Interrelationships of low-tech and high-tech sectors in an economy are of major importance for the innovativeness of industry in general (cf. III 2.).

The project findings also emphasise that future industrial development in Europe does not depend on making a choice between high-tech and LMT industries. Rather, all these sectors are inextricably linked. In particular, low-tech and medium-low-tech industries are crucially important as customers of high-tech sectors in developed economies. This relationship means that the continued viability of the high-tech sector is inevitably linked to the on-going vitality of LMT industries, a symbiotic relationship that is often overlooked.

Policy conclusion (cf. III 5. and 4.)

In spite of the difficult overall economic situation of low-tech and medium-low-tech industries and the challenges of globalisation and growing competition, the future prospects of many LMT sectors and companies are not bad or may even be bright, depending on some structural conditions. This holds true for companies whose specific competencies cannot easily be copied by potential competitors; for firms that are active in markets where geographical and social proximity is a competitive advantage; and finally for companies that are able to absorb distributed knowledge (be it scientific or of any other type) and to employ up-to-date process technologies systematically and efficiently.

These conditions are not given for all LMT companies, and it is likewise true that not all companies in Europe are able to develop in this direction or really use structural conditions of this type in a competitive way when they face them. But

there is no reason to believe that LMT companies are, in principle, less likely to face the challenge than research-intensive firms are.

What separates successful companies from others in the long run is the ability to innovate. And innovativeness is by no means an issue only for those with a high R&D budget. Hence, non-discriminatory support of innovativeness is a major policy topic. Our research findings lead to a number of problems concerning innovation policy in the lowtech and medium-low-tech sectors. Several policy issues should be highlighted.

• First, there is little if any awareness of innovation-supporting policies other than focusing on R&D.

• Second, it is an important policy task to devise measures and to support activities which aim at improving the knowledge base and the capabilities of low-tech and medium-low-tech companies.

• Third, policies should focus on the development of firm capabilities to meet the demands of cross-company co-operation with corresponding channels of communication, gateways and personnel responsibilities.

• Fourth, policies should encourage both the generation of knowledge and its diffusion between low-tech and high-tech sectors, and they should also promote stronger interrelationships between the sectors.

These considerations should also lead to a new understanding of the restructuring of the economic landscape of Europe in the early years of the 21st century. This future does not appear to foretoken wholesale structural replacement of "old" sectors with "new" ones, or a substitution of "old" technologies with "new" ones, so much as a continually changing blend of technologies of various vintages. This process of change is evolving as a restructuring of sectoral and technological systems, transformed more from within than from without. It is not dominated by industrial activities for which competitive advantage, capability formation and economic change are generated by front line technological knowledge. Rather, it is dominated by what are often pejoratively termed low-tech and medium-low-tech industries. And it is unambiguously characterised by the continuous combination and re-combination of high and low-tech attributes.

2. Bibliography

Bardi A., Bertini S. (eds.) 2005: Dinamiche territoriali e nuova industria, Rimini: Maggioli Editore.

Bardi, Andrea 2006: Emilia-Romagna after industrial districts: regional policy implications (approved for Publication by CEDEFOP).

Bardi A., Calabrese G. 2006: Gli impatti dell'industria automobilistica sui modelli di sviluppo regionale, in Bardi A., Garibaldo F., Telljohann V. (eds.), A passo d'auto - Impresa e lavoro nel settore automobistico, Maggioli Editore, Rimini (approved for publication).

Bender, G.; Jacobson, D. and Robertson, P. L. (eds.) 2006: Non-Research-Intensive Industries in the Knowledge Economy. Perspectives on Economic Political and Social Integration, Special Issue 1. Lublin/PL: Catholic University.

Böheim, M. 2006: Anmerkungen zur technologiepolitischen Relevanz der Interdependenzen von high-tech und low-tech Industrien, in: BMBWK/BMVIT/BMWA (Hrsg.), Österreichischer Forschungs- und Technologiebericht 2006, Wien.

Borkowski, Tadeusz and Marcinkowski, Alexander 2004: Spoleczno-psychologiczne uwarunkowania wprowadzania innowacji w przedsiebiorstwie. (Socio-psychological conditions of the implementation of an innovation in an enterprise) In: E. Okon-Horodynska (d.) Rola nauki polskiej we wzroscie innowacyjnosci gospodarki. (The role of the Polish sciences in the growth of the innovativeness of an economy). Warsaw: Polish Economic Society, 197-220.

Borkowski, Tadeusz and Marcinkowski, Alexander 2004: O wielowymiarowym rozumieniu innowacji, proinnowacyjnych organizacjach i proinnowacyjnym mysleniu. (On multidimensional meaning of innovation, pro-innovative organisations and pro-innovative thinking). In: Jan Skalik (ed.), Zmiana warunkiem sukcesu. Zmiana a innowacyjnosc organizacji. (Transformation as condition of success. Transformation and innovation in organization) Wroclaw: Wydawnictwo Akademii Ekonomicznej we Wroclawiu. (Academy of Economics in Wroclaw Press), 30-40.

Hirsch-Kreinsen, Hartmut 2004: „Low-technology" – Ein innovationspolitisch vergessener Sektor. (Low-tech – a forgotten sector in innovation policy). WSI Mitteilungen 4/2004, 222-225. 100

Hirsch-Kreinsen, H. Jacobson, D. and Laestadius, S. (eds.) 2005: Low-tech Innovation in the Knowledge Economy, Frankfurt: P. Lang.

Hirsch-Kreinsen, Hartmut; Jacobson, David and Robertson, Paul L. 2006, „Low-Tech" Industries: Innovativeness and Development Perspectives. A Summary of a European Research Project (to appear in Prometheus, March).

Köhler, Holm-Detlev 2003: La sociedad asturiana asentada en el declive (The Asturian society embedded in decline). Papeles de economía española. Economía de las comunidades autónomas, No. 20, 19-31.

Laestadius, Staffan 2005: The rise and fall of management of innovation – the transformation of a concept and of management practice in the knowledge economy. In: J. Sundbo, A. Gallina, G. Serin and J. Davis (eds.) 2005: Contemporary Management of Innovation: Are We Looking at the Right Things? Houndmills: Palgrave Macmillan.

Marcinkowski, Aleksander 2005: PILOT Project Aims and Methodology. Newsletter 26, Jagiellonian University Press, Winter/Spring.

Pedersen Trond Einar 2004: Two types of 'low-tech' sophistication: production techniques, product design and formal competence in Norwegian mechanical engineering. Paper for the DRUID Summer Conference 2004 on Industrial Dynamics, Innovation and Development, Elsinore, Denmark, 14-16 June 2004.

PILOT Consortium: PILOT Newsletter (six volumes).

Robertson, Paul; Pol, Eduardo and Carroll, Peter 2003: Receptive capacity of established industries as a limiting factor in the economy's rate of innovation. Industry and Innovation, Vol.10, No.4, 457-474.

Robertson, Paul; Keil, Thomas and Autio, Erkko 2003: Weak and strong ties, Individualism-collectivism, and the diffusion of technological knowledge. 275-305 in: D. V. Gibson, Ch. Stolp, P. Conceiçâo and M. V. Heitor (eds.), Systems and

policies for the globalized learning economy, Series on "Technology Policy and Innovation. Vol.3. Westport: Ct: Praeger.

Robertson, Paul L. and Verona, Gianmario 2006: The Effects of Technological Change on the Boundaries of Existing Firms. In: Maureen McKelvey and Magnus Holmén, (eds.): Flexibility and Stability in Economic Transformation. Oxford: Oxford University Press, pp. 201-225.

Robertson Paul L. and Verona, Gianmario 2006: Post-Chandlerian Firms: Technological Change and Firm Boundaries (to appear in the Australian Economic History Review, March).

Schmierl, Klaus 2006: Qualität der Arbeit als Kriterium der Standortbindung im Einfachproduktsektor (Work quality: a criterion for 'stickiness' in simple-product industries). In: O. Cernavin, M. Führ, H. Kaltenbach and F. Thiessen (eds.): Innovative Region durch Qualität der Arbeit (Innovative regions by means of work quality). Berlin (forthcoming).

Smith, Keith 2005: Measuring innovation. 148-177 in: J. Fagerberg, D. Mowery and R. Nelson (eds.), Handbook of Innovation. Oxford: Oxford University Press.

Zaleski, Zbigniew 2003: Internal and external determinants of innovation in small, lowtech enterprises. A socio-psychological approach. Journal for Perspectives of Economic Political and Social Integration, Vol. IX, No.1-2: 169-196.