IMPLEMENTING INNOVATION MANAGEMENT SYSTEMS IN THE CERAMIC SECTOR IN CASTELLÓN

José Miguel Morte Poles [(1)], Ignacio Vila Barber [(2)]

[(1)] QUACER, S.L., SPAIN, [(2)] INVATE, SPAIN

1. INNOVATION MANAGEMENT

The research, technological development and innovation taking place in a country are critical factors for determining its economic growth, levels of well being and international competitiveness. These are key elements for the survival of organisations and contribute to situating companies in an appropriate position for dealing with the new challenges that are appearing in an increasingly globalised market.

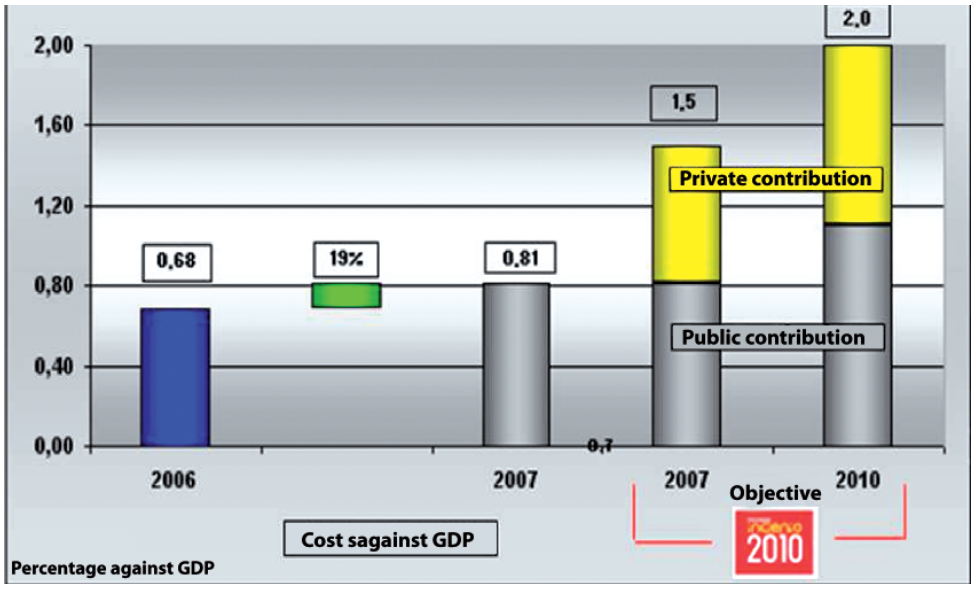
Their strategic importance for the country has led the Government to encourage these activities to the greatest possible extent, by means of tax benefits under Company Law (article 33) to companies that spend money on R&D&I.

To make it easy to access these deductibles, companies can apply for a report from the Ministry of Industry, which is binding on the Tax Administration, which sets out the content of the research, development and innovation of its projects (first supplementary provision to Law 7/2003, BOE 2 April). To get access to this report, the project can be certified by a certifying body.

Investment in R&D&I is essential to maintain and increase growth, productivity and well-being in our society. In this respect, the gap separating our country from the others in its environment will make this objective a scientific and technological priority for Spain over the coming years.

The amount spent on R&D&I has increased progressively throughout recent years as shown in the following graph. R&D&I is shown against GDP (Gross Domestic Product) in 2006 and 2007, together with the forecast for 2010, in the INGENIO 2010 programme:

The investments in R&D&I can be subsidised or even made tax deductible by means of different national, regional or European lines of support. The following table shows the projects and subsidies approved in the Valencia Region, together with the tax deductions obtained according to the 2004 and 2005 tax years:



Source: MITyC
Graph 1. R&D&I spend of GNP

PROFIT 2006	APPLICATIONS APPROVED	SUBSIDY GRANTED 2006	CREDIT GRANTED 2006	SUBSIDY GRANTED 2007	CREDIT GRANTED 2007
Projects approved Valencia Region	123 10%	5,936,451 10%	17,646,770 8%	341,884 5%	1,265,836 7%
Total applications	1,256	58,471,451	215,916,987	7,508,880	17,125,118
PROFIT 2007	**APPLICATIONS APPROVED**	**SUBSIDY GRANTED 2007**	**CREDIT GRANTED 2007**	**SUBSIDY GRANTED 2008**	**CREDIT GRANTED 2008**
Projects approved Valencia Region	134 10%	5,509,546,27 11%	29,244,436,38 9%	139,905,90 3%	1,901,903,00 7%
Total applications	1,285	52,390,045,88	322,344,380,70	5,207,274,91	29,073,360,50
Profit support		**2006**	**2007**	**2008**	
Subsidy		5,936,451	5,851,430,	139,906	
Loan		17,646,700	30,510,272	1,901,903	
Current net value Loan *0,3		5,294,010	9,153,082		
Subsidy and equivalent subsidy		11,230,461	18,055,539		

Source: MITyC
Table 1. Applications for R&D projects in the Valencia Region

	R&D	I	TOTAL
2004 Fiscal Year			
Number of projects	31	9	40
Sum qualified	19,645,435	8,127,415	
Estimated deductions (R&D 40%, I 10%)	7,858,174	812,742	8,670,916
2005 Fiscal Year (Provisional data)			
Number of projects	51,	20	71
Sum qualified	21,923,774	10,268,162	
Estimated deductions (R&D 40%, I 10%)	8,769,510	1,026,816	9,796,326

Source: MITyC
Table 2. Tax Deductions.

Although research, development and innovation have always been considered prestigious activities, the real situation has shown us that traditionally, we have tended to be consumers of technology and outside ideas ("that others invent"...) rather than originators.

However, during recent years, with the effects of globalisation and the dramatic development of information technology and technological convergence, R&D&I has become a useful weapon for maintaining the standards of social well-being and progress enjoyed by advanced economies, which are now faced with the drive and competitiveness of the inappropriately-named emerging countries, which are really more of a disturbing reality.

Different social, business and university forums have been predicting the need to foster R&D&I activities, and both the European and Spanish governments are running programmes and activities to motivate and raise awareness of this, providing significant tax deductions for these activities, as they are conscious of what is at stake.

Quality and environmental management and workplace risk prevention are being tackled systematically by companies. However, R&D&I activities, as such, also need to be managed in an appropriate manner. Organisations must be given the tools they need to allow them to develop R&D&I as a differential factor in competitiveness.

This means they can obtain additional advantages, as well as tax deductions, by certifying their R&D&I processes or going a step further and introducing R&D&I management systems that systemise research, development and innovation activities in the organisations.

The key question is how to encourage companies to innovate (or how them to innovate in an increasingly "orderly" way). It is important to stress that innovation is not just a question of companies coming up with innovative ideas from time to time. What it involves is setting up a system that will allow them to innovate. Not only must they come up with great ideas, but these must be accompanied by structures that encourage their production, channelling, starting up and exploiting the R&D&I projects.

2. INNOVATION IN THE SPANISH CERAMIC INDUSTRY

It is true to say that the current technology situation of the Spanish ceramic industry is good, as together with Italy it is the world's second largest tile producer after China.

Nevertheless, the situation of the market and increased globalisation mean it is necessary to change the way innovation is managed in companies, which must adapt to technological changes and new market opportunities.

One of the main problems involved in innovation management is that in the majority of ceramic companies, R&D&I is not regulated by a sufficiently well-developed system, especially in the case of SMEs, which account for most of the ceramic production sector in Castellón.

Spanish ceramic companies currently use the most up-to-date technology available for manufacturing tiles; however, the difficulty lies in the fact that they are dependent on Italian machinery and technology. Developing own machinery and technology is an area that has still not been addressed by this sector.

It is a fact that the majority of Spanish ceramic companies, especially SMEs, do not have the infrastructure required to produce, through their own R&D&I activities, even a small part of the technology needed to innovate at a pace that will allow them to maintain or increase their competitiveness. In general, Spanish ceramic companies are usually more concerned with productivity in their facilities involvement in R&D&I activities. On the other hand, the low profitability of the resources needed to undertake such activities means that SMEs only get involved in these R&D&I on rare occasions. They generally limit themselves to using assimilated industrial innovation and acquired technological development.

However, it must be stressed that the special characteristics of the ceramic cluster in Castellón has allowed technological development in the sector. Thanks to the close relationships established between manufacturers, suppliers, competitors, research and training centres, and others belonging to the cluster, technological diffusion has taken place, characterised by its intensity and speed, and because it is based on the effects of imitation and monitoring, it has allowed technological discontinuities that have appeared over recent years to be taken advantage of.

The work of UJI, ITC and other provincial bodies, such as the Castellón College of Engineers, the Chamber of Commerce, the Association of Ceramic Technicians, and the Spanish Ceramic and Glass Society, has enabled a team to be created in the sector that contributes to the excellence of the innovative capabilities of ceramic companies.

The incorporation of this team, highly trained in technology, has been an excellent way of fostering technological exchange and of enriching Spanish ceramic companies.

In spite of this promising dynamic, the real situation of the statistics with reference to innovation in Spanish ceramic companies is not all we would wish it to be. As we said before, poor short-term profitability of R&D&I actions and the business view focused on profitability means that few innovation projects are set up, with the exception of the technical leadership achieved in the ceramic glaze subsector.

	2004 Fiscal Year	2005 Fiscal Year
Applications made	6	10
Notified	5	9

Source: MITyC
Table 3. Applications for R&D projects in the ceramic sector.

	R&D			I		
Fiscal year	**No. Pr**	**Amount**	**Average cost**	**No. pr**	**Amount**	**Average cost**
2004	5	2,992,033,53	598,406,71	0	0,00	0,0
2005	8	3,742,871,48	467,858,94	1	885,035,32	885,035,32

Source: MITyC
Table 4. Projects notified in the Ceramic Sector in the Valencia Region

	Projects	%	R&D Cost	%
Dedicated R&D staff	1	13	24,452,70	1
Non-dedicated R&D staff	8	100	2,009,298,59	54
Col. Ext.RD2609 University for R&D		0	0,00	0
Col. Ext.RD2609 OPI R&D	3	0	0,00	0
Col. Ext.RD2609 CCTT R&D	5	38	146,427,19	4
Col. Ext. National R&D	1	63	765,767,39	20
Col. Ext. Foreign R&D	3	13	10,000,00	0
R&D Assets	6	38	271,599,84	7
R&D Fungibles	1	75	514,770,35	14
R&D others		13	435,42	0
Total			**3,742,871,48**	

Source: MITyC
Table 5. Costs incurred in R&D&I in the Ceramic Sector in the Valencia Region

The following tables set out the project granted for the ceramic sector as per the National Materials Programme:

		2007	
		SUBSIDY	CREDIT
NATIONAL MATERIALS PROGRAMME	14	710,208,50	1,443,480,75

Current value of loan 433,044
Equivalent subsidy 1,143,253

Source: MITyC
Table 6. National Materials Projects Plan –Valencia Region

Fiscal year	Estimated deduction
2004	1,196,813
2005	1,585,652

Source: MITyC
Table 7. Estimated tax deduction

3. R&D&I MANAGEMENT SYSTEMS

To systemise company R&D&I actions, standards UNE 166000:2006 "R&D&I management: Terminology and definitions of R&D&I activities", UNE 166001:2006 "R&D&I Management: Requirements of an R&D&I project" and UNE 166002:2006 "R&D&I Management: Requirements of the R&D&I System", have been drawn up.

The introduction of an R&D&I Management System according to Standard UNE 166002:2006 contributes to optimising research, development and technological innovation processes for the organisation, easing recognition of emerging technologies or new technologies applied in the sector, the development of which provides it with a base for strengthening its R&D&I activities.

The requirements of the Management System of the R&D&I specified in these standards are complementary to the requirements of any other management system introduced in the organisation, such as quality management, environmental management safety management and ethical and social management.

An R&D&I management system is defined as part of the general management system that includes the organisational structure, activity planning, practices, procedures, processes and resources for developing, introducing, carrying out, reviewing and keeping the company's R&D&I policy up to date.

A management system allows companies to plan, organise and manage the R&D&I activities:

- Systemising the R&D&I activities to take advantage of "internal knowledge" of the companies.
- Increasing the capacity for innovation and therefore competitiveness.
    - Generating new concepts and develop new products and technologies.
    - Redefining production and commercial processes.
    - Attracting new markets.
    - Producing new knowledge.
    - Managing knowledge and technology.
- Establishing objectives and goals that help us to control the resources associated with these activities.
- Planning, organising and monitoring R&D&I units, leading to savings in resources and improved motivation and involvement of the employees.
- Bringing added value in the form of confidence of the R&D&I in the company through the management system, easing technology transfer.
- Improving the image of the company and its competitiveness against other companies in the sector in the national and international areas.

- Carrying out the necessary technological watch that allows them to anticipate changes in the market and identify new opportunities for improvement.
- Integrating R&D&I management into the remaining management systems introduced in the company.
- Establishing the interaction of R&D&I with other departments or divisions of the company.
- Achieving own patented technology that allows subsequent licensing or sale.
- Satisfying the shareholders by showing the added value contributed by the company's R&D&I activities.
- Showing the Government and other organisations evaluating the R&D&I projects for possible financing, the transparency of these activities in the company.
- Keeping up to date in monitoring up the advance of new technologies around the world.
- Performing analysis, continuous improvement and correct measurement of the results of the research, development and innovation activities.

Standard UNE 166001:2006 is the reference for defining, documenting and defining R&D&I projects and also includes aspects relating to the management of projects and the subsequent use of the results.

There are two types of R&D&I Project Certification:

- **Certifying contents and budgets**

  Project compliance with standard UNE 166001 is determined and a technical report, in accordance with Company Tax Law, establishes the R&D&I content of the product.

- **Certifying contents and performance**

  In addition to what is included in the foregoing type, an audit is performed in which project execution is verified.

4. EXPERIENCE IN IMPLEMENTING SYSTEMS IN THE SPANISH CERAMIC INDUSTRY

In 2004, based on the approval of a project by IMPIVA, INVATE and a group of specialised consultants introduced a Management System for R&D&I in companies in the ceramic sector in Castellón. We are going to summarise the problems found in the target companies and the benefits obtained by these after the effective implementation of Standard UNE 166002-2006.

The problems found were totally different depending on the subsector of the ceramic sector to which the company belonged.

Everybody knows the innovative drive that characterises the economic activity of Spanish glaze companies, which are, without a shadow of a doubt, world leaders in technology. We could almost say the same of machinery manufacturing companies which have also, to a lesser degree, been developing innovative products for years, especially in regard to tile decoration.

But our study concentrates on the analysis of companies manufacturing floor and wall tiles which have an R&D&I system in place according to the requirements of the UNE-166002:2006 standard.

4.1. PROBLEMS ENCOUNTERED

A diagnosis was made of each of the companies we worked with before introducing the R&D&I Management System.

The situation found was as follows:

- A lack of systemisation and organisation of the R&D&I tasks.
- Little collaboration with research centres.
- The innovation activity is based on incorporating new technologies contributed by suppliers (glazes and machinery).
- Laboratory technicians are only involved in quality control and developing new designs provided by the glaze companies.
- Lack of dialogue between the laboratory technicians and the commercial department means the vision of the client is lost.
- Lack of dialogue between laboratory technicians and the sales department means opportunities for obtaining deductions and subsidies are lost.
- The existence of an organised documentary structure, as the majority of companies have Quality Management Systems in place based on the ISO-9001 standard.
- No confidence in the Patent and Copyright Systems.
- Little technology watch.
- No documentation for R&D&I projects, which are initiated based on the personal decision of the laboratory or company manager.
- Employee creativity is not encouraged at all.
- Human resources are very well trained, but their research function is sacrificed entirely in order to improve productivity.
- Inertia on the part of personnel when faced with changes.
- Projects are initiated by individuals, with little communication between departments.
- Facility for introducing technologies that have already been developed (the existence of the cluster makes it easy to “copy” technology).

4.2. IMPROVEMENTS IMPLEMENTED

The benefits obtained by the company can be summarised as follows:

- Planning, organisation and control of R&D&I activities have been improved.
- A team of persons from all the departments involved has been created (management, laboratory, production, sales, administration and procurement) that systematically manages and controls the company's innovation and plans its future.
- There is rigorous control over projects initiated (costs, timetable, personnel specialising in the project, etc).
- Management's commitment to R&D&I management has been documented and all the employees are aware of this commitment.
- Agile communication has been achieved between departments with regard to R&D&I projects.
- Technology watch is carried out systematically, enabling the innovative evolution in the sector to be known. Some projects have originated from this.
- Some "clear" guidelines have been introduced to systemise and standardise the criteria of R&D&I activities.
- The basic objectives and markers for R&D&I activities are established and defined.
- An objective selection is made and the portfolio of R&D&I projects is appropriately managed.
- Effective protection of the results of the R&D&I projects is ensured.
- The transfer of technology and the performance of R&D&I activities are encouraged.
- R&D&I is considered a differential factor for competitiveness, and is accepted by all management personnel.
- Savings have been made in R&D&I activities with good cost control.
- Projects are documented in an appropriate manner, both for the purposes of applying for subsidies and for obtaining tax deductions, obtaining financial resources that make it profitable to initiate R&D&I projects.
- There is still a marked lack of encouragement for creativity.

5. CONCLUSIONS

The current technology situation in the Spanish ceramic sector is good. Spain, together with Italy, is ranked second in the world in the production of ceramic floor and wall tiles.

According to statistical data on investments in R&D&I, the Valencia Region contributes significantly to company innovation.

However, the innovation management model of the companies must change in response to growing globalisation.

It is necessary to adapt to the changes in technology and new market opportunities, which means that the company needs to innovate continuously in their activities.

R&D&I Management Systems help R&D&I to be run in a systematic and organised manner, so that innovation is incorporated into the day-to-day operations of the organisations. This will help companies adapt to the new technological situation and new business opportunities.

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