European Economic and Social Committee

INT/325
Investment in Knowledge and Innovation

Brussels, 12 July 2007

OPINION

of the
European Economic and Social Committee on
Investment in Knowledge and Innovation (Lisbon Strategy)
(own-initiative opinion)

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On 14 September 2006, the European Economic and Social Committee, acting under Rule 31 of its Rules of Procedure, decided to instruct its Section for the Single Market, Production and Consumption to draw up an information report on

Investment in Knowledge and Innovation.

At the plenary session on 14-15 March 2007, it was decided to change the information report into an own-initiative opinion (Article 29(2) of the Rules of Procedure).

The Section for the Single Market, Production and Consumption, which was responsible for preparing the Committee's work on the subject, adopted its opinion on 3 May 2007. The rapporteur was **Mr Wolf**.

At its 437th plenary session, held on 11/12 July 2007 (meeting of 12 July), the European Economic and Social Committee adopted the following opinion by 120 votes with one abstention.

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1. Introduction

1.1 Under the heading "THE RELAUNCHED LISBON STRATEGY FOR JOBS AND GROWTH", the European Council, in its Presidency Conclusions of 23-24 March 2006 (point 12), welcomed the initiative taken up by the European Economic and Social Committee to increase ownership of the Lisbon Strategy at Community level. It encouraged the European Economic and Social Committee to continue its work and asked it for a summary report in support of the Partnership for growth and employment in early 2008.

1.2 In the meantime, on 15 February 2007, the Committee adopted a resolution on the implementation of the renewed Lisbon Strategy, to be presented to the Spring 2007 European Summit.

1.3 In preparation for the summary report requested by the European Council, four information reports on the following topics will be drawn up:

- Investment in Knowledge and Innovation;
- Business potential, especially of SMEs;
- Employment of priority categories;
- An Energy Policy for Europe.

These information reports will form the key points of the summary report.

1.4 The following text, which was drawn up in cooperation with representatives of the national economic and social councils of some Member States, deals solely with the subject of investment in knowledge and innovation.

2. Summary and recommendations

2.1 Europe's strength lies in the capabilities and performance of its citizens.

2.2 The free interaction of inventive craftsmanship and entrepreneurial initiative with scientific methods and systems and the technologies and industrial processes that developed out of them was the European recipe for success that brought about the progress that led to the living standard we enjoy today. This went hand in hand with historical socio-political developments, resulting in the free citizen in the modern state with separation of powers, democracy and fundamental rights.

2.3 The development and intensive use of energy-consuming industrial processes, machines and transport systems made a decisive contribution to this. Energy freed people from the burden of the heaviest physical labour, multiplied their productivity, provided heating and lighting, and made previously unimaginable mobility and communication possible. Energy became the food and fuel of modern economies.

2.3.1 In the light of the finite reserves of fossil fuels, the rapidly rising worldwide demand for energy, and the expected impact of energy consumption on climate change, it is unsurprising that securing sustainable and climate-friendly energy supplies is at the top of the political agenda. A key prerequisite to achieving this very difficult objective is a strong, wide-ranging and effective research and development programme for energy.

2.4 However, above and beyond this, there are a great many more problems and tasks that can only be solved by research, development and innovation. These include, for example, combating physical and mental illness, making life and participation in society easier for people with disabilities, the effects of demographic change (including gerontology), protecting the environment, and, more generally, protecting and developing our way of life, our

European values system and our social model. All things considered, however, research and development also serve the fundamental aim of bringing about greater and new knowledge. Increased knowledge not only helps us to solve problems, but also broadens our world view, objectifies conflict situations, and enriches our culture.

2.5 Moreover, the European Union faces the challenge of increasing global competition, the challenge being to maintain European jobs, prosperity and social and environmental standards. This is true not just because of the economic power of the USA and Japan, but above all because of the increasingly strong industrial and research performance of countries such as China, India and Brazil, and in view of the significantly lower wages and social and environmental standards in those countries.

2.6 The only way to deal with this is to continue in the future to stay ahead in research, technological development and innovation, rooted in a socio-cultural environment of democracy, the rule of law, political stability, free enterprise, planning security, motivation, the recognition of achievements, and social security.

2.7 Top performances in the scientific and technical field, and their entrepreneurial conversion into a competitive, economic force, are essential preconditions to safeguarding our future (not least with regard to energy and climate issues), preserving and improving our current global position, and developing rather than jeopardising the European social model.

2.8 The basic prerequisite for achieving this goal is a social climate that is open to progress and innovation, in which society fully understands this and all its implications, so that politicians at all levels create the necessary conditions and take decisions that are conducive to such progress, and so that enough business confidence and optimism is built up for the necessary investments to be made in Europe and new jobs to be created. This also includes raising awareness of the fundamental significance of basic research, as this lays the necessary foundations for future innovations. An entrepreneurial spirit that is willing to innovate and take risks is particularly needed, as are political leadership, dependability and a sense of reality.

2.9 In particular, the Barcelona target set for the purpose of implementing the Lisbon strategy must be taken very seriously by all the relevant stakeholders if Europe is not to fall further behind its global competitors in terms of R&D investment. This target states that total R&D expenditure in the EU should be increased such that it reaches around 3% of GDP by 2010. Two thirds of the required investment is to come from the private sector.

2.10 In December 2006, the Council adopted the Seventh R&D framework programme (FP7) for 2007-2013. The budget for this programme, at around EUR 50 billion, was significantly higher than for the previous one. This is another significant European policy success, which the Committee has substantially supported. However, the Community will still only be providing about 2% (in other words, only one fiftieth) of the total investment in research and

development aimed for by the Barcelona target. As the Committee has repeatedly stressed, this is insufficient to maximise the intended multiplier and integrating effects that EU funding has on Member States' research funding and the willingness of industry to invest.

2.11 Therefore, the Committee reiterates its recommendation that this part of EU funding should, as a first step, be increased by half, i.e. to around 3% of the total investment aimed for by the Barcelona target, as part of the revision of the EU budget planned for 2008. This is especially relevant in the light of the future European Technology Institute (ETI) and the urgent need for more R&D into climate-friendly sustainable energy supply.

2.12 Equally, however, the willingness of industry, and in particular small and medium-sized enterprises, to invest in research and development needs to be promoted and made more attractive and profitable through appropriate legal (including laws on liability), administrative, fiscal and financial framework conditions. EU law on state aid also has an important role to play here; it should enable the Member States to provide more effective and less bureaucratic support than in the past for the research and development plans of universities, research organisations and industry, and help them to establish networks. Careful consideration should therefore be given to the question of whether the Community framework for state aid to research, development and innovation really is conducive to these goals.

2.13 Knowledge is based on two equally important and interdependent pillars: education and research. New knowledge must be attained through research and development. The starting point is existing knowledge. This must be consolidated and passed on through education, training and lifelong learning. Both the methods and the content should be assessed as to whether they are conducive to the specified aims. Both these pillars also need significantly increased financial investment and suitable framework conditions.

2.14 Europe's strength lies in the capabilities and performance of its citizens. Doing more to promote and develop these capabilities must therefore be a priority. Accordingly, the Committee calls on the Member States to strengthen and improve their educational establishments and to put in the considerable investment necessary to achieve this. Sound education and training for the masses is just as important as the education of the academic elite. With this in mind, a wide range and sufficient number of sound and appropriate educational establishments, from primary schools to universities, are necessary. Only then will European society as a whole be receptive to education and science.

2.15 In addition, the Committee repeats its recommendation that a common European knowledge area be developed to complement the European Research Area, through closer supranational cooperation in the areas of learning, innovation and research. Any incentives and measures in support of lifelong learning have an important role to play here. Lifelong learning is the key to the knowledge society. Obstacles to the single market that are obstructing the transition to the European knowledge society must be removed as quickly as possible.

2.16 This includes still greater support from Member States for personal mobility, and strengthening relevant, effective EU programmes (Erasmus, Marie Curie). Mobility is conducive to attaining and transferring skills. Free movement of workers, researchers and students across Europe must be guaranteed, and rewarded by means of incentives; it must go hand in hand with decent income, working conditions and support for families. Public bodies across Europe also need to improve access to information in this area.

2.17 As regards the significance and promotion of innovation, the Committee refers not only to its detailed recommendations set out below, but especially to the excellent Aho Report, which it endorses. This particularly concerns the legal and social environment for innovative entrepreneurship and an innovation-friendly market. The Committee also refers to its more detailed opinion on *Unlocking and strengthening Europe's potential for research, development and innovation*.

2.18 Progress and innovation take place when new knowledge is turned into new and better processes and products (including ongoing improvement of existing ones), new societal models, and the requisite management methods; thus, the key is an innovative entrepreneurial spirit and entrepreneurial initiatives. That said, progress and innovation also depend on new kinds of services, on developing healthcare services, and in general on better solutions to social problems within the economic constraints that exist.

2.19 Thus, innovation means devising and implementing new technologies, processes, organisational methods, business models, educational models etc. that previously had not been, or could not be, considered. It is therefore important that relevant legislation offers sufficient room for manoeuvre to give new ideas that were not previously thought of the chance to be put into practice and not to wither away before they even take root simply because they do not fit into the framework of excessively detailed regulation. Over-restrictive regulation is a brake on innovation. The Committee therefore supports all efforts to simplify regulations and to check them for superfluous, excessively detailed and/or unnecessarily restrictive requirements.

2.20 Innovation means accepting a certain level of risk of failure and indeed of losses; generally speaking, the effectiveness, or indeed the disadvantages or side-effects, of a new approach or idea is only recognised when it has proven itself in practice and in competition with other processes. Even failure provides lessons. Opportunity and risk are two sides of the same coin. As a rule, the expected benefit of an innovation should outweigh the possible risks associated with it. Potential risks to society require a special assessment. Consideration could also be given to whether – at least for small and medium-sized enterprises – a risk fund (for example at the EIB) should be set up to help cover possible losses.

2.21 The Committee has repeatedly pointed out that human capital is the most delicate and most valuable resource for knowledge and innovation. Requisite training bodies that are sufficient

in number, resources and quality are therefore key prerequisites for meeting the demand for good scientists, engineers and teachers.

2.22 By virtue of the investment carried out by society on the one hand, and by individual researchers on the other, with a view to acquiring broadly-based and not readily accessible fundamental knowledge and high-level specialised knowledge, society – as represented by politicians – assumes responsibility for making optimal use of this investment. This responsibility must be reflected in a concern to ensure that trained research workers and engineers are able to start families and are provided with appropriate job opportunities and suitable career paths, with attractive options for branching out into other fields, without running the risk of being professionally sidelined or sent down dead ends. If qualified scientists and engineers are unemployed, underpaid or underemployed (inter alia through excessive administration and committee work), this represents a waste of economic investment and serves as a deterrent for the next generation of top-level scientists and engineers, with the result that they opt for non-scientific and non-technological careers or emigrate from Europe.

2.23 This does not rule out the need to involve experienced experts and scientific and technical achievers more than hitherto in relevant decision-making processes and administrative dossiers relating to research policy, entrepreneurial and innovation policy matters. The establishment of the European Research Council (ERC) is a very encouraging first step in this direction. However, sufficient relevant expertise also needs to be attracted to and retained in EU (including the Commission) and Member State bodies that provide funding for research and innovation. Administration alone is not enough.

2.24 Turning research and innovation into industrial products and processes raises a particular set of issues. The Lisbon target of two-thirds of R&D investment coming from industry is not without reason. It is therefore particularly important to enhance the professional image of entrepreneurs and to raise public awareness of their key role in innovation, economic progress and prosperity in general. For this reason, the Committee, as the bridge to organised civil society, has put entrepreneurship with a human face at the centre of its forthcoming work programme. Only through responsible, energetic and imaginative entrepreneurship that is able to develop freely will the Lisbon goals be achieved.

2.25 Many further aspects and details are dealt with in the more comprehensive comments below, and also in the Committee opinions on *The road to the European knowledge-based society – the contribution of organised civil society to the Lisbon Strategy*[1] and *Unlocking and strengthening Europe's potential for research, development and innovation*[2].

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1 CESE 1500/2005 (OJ C 65, 17.3.2006).

2 CESE 1566/2006 (OJ C 325, 30.12.2006).

3. General observations

3.1 **Development of science and technology.** Europe is the cradle of ever-evolving modern science and research. If the Greek/Egyptian cultural area is taken into consideration, along with the cross-fertilisation with the Indian-Arabic[3] cultural area that has taken place from time to time, then it can be said to be the cradle of science generally. Despite various ups and downs over time and some interruptions caused by war, science and research were linked right across Europe, irrespective of national borders. Their methods and way of thinking were decisive in paving the way to our contemporary European society, its values, its way of life and its standard of living; they were a defining characteristic of the European cultural area[4]. The recipe for success of the resulting achievements was the free interaction of inventive craftsmanship and entrepreneurial initiative with scientific methods and systems and the technologies and industrial processes that developed out of that.

3.2 **Development of society.** The key social developments that led to free citizens in the modern state with separation of powers, democracy, fundamental rights and social welfare legislation went almost hand in hand with scientific and technological progress.

3.3 **Development of living conditions.** As a consequence of these parallel processes, the living conditions of people in the countries and regions involved have changed and improved as never before in human history. In the last 135 years, the average life expectancy of the population[5] has more than doubled[6]. In the last 50 years, agricultural yield in terms of surface area has almost trebled. In the successful industrialised countries, the talk is now of obesity rather than malnutrition, of information overload rather than a lack of information, and of an ageing population rather than child mortality. The capabilities and achievements of modern, mobile industrial society that have come about through research, science and innovation touch every area of human development and quality of life.

3.4 **Use of energy.** The development and intensive use of energy-consuming industrial processes, machines and transport systems made a significant contribution to the progress that has been made. Energy freed people from the burden of the heaviest physical labour, multiplied their productivity, provided heat and light, and made previously unimaginable mobility, communication and cultural development possible. Energy became the food and fuel of modern economies.

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3 Possibly also with the Chinese cultural area.

4 A very comprehensive and detailed description of these processes can be found in the Committee's own-initiative opinion on *Science, society and the citizen in Europe* (CES 724/ 2001, OJ C 221, 7.8.2001).

5 In Germany.

6 Not least thanks to a reduction in child mortality.

3.5 **The climate issue and energy supply.** However, this significant development brings with it new problems and challenges. Global warming, its possible consequences, and strategies for reducing it are the subject of far-reaching political decisions[7] and a large number of studies[8], some of which have controversial conclusions. The Stern Review[9], entitled *The Economics of Climate Change* and published at the end of October 2006, has established that reducing global warming caused by greenhouse gases will cost around 1% of GDP, which in particular includes further R&D activities that are necessary for this purpose. However, even leaving aside the problem of climate change, the issue of safe, sustainable energy supply for Europe (and indeed the world) is one of the central political challenges which significantly increased research and development will play a very important role in resolving[10].

3.6 **Further problems and challenges**[11] However, climate change and energy supply are not the only problem. Further examples of important areas of research on which the Committee has made detailed recommendations in earlier opinions such as that on the Seventh R&D framework programme[12] and that on its Specific Programmes[13] include combating physical and mental illness, making life easier for disabled or otherwise disadvantaged people with the aim of improving their professional development and participation in the knowledge society; the effects of demographic change (plus gerontology); a better understanding of complex economic, social and cultural issues, how they are related, and their impact on each other; protecting the environment; and, more generally, protecting and developing our way of life, our European values system and our social model.

3.7 **Global competition.** Moreover, the European Union faces the very serious challenge of increasing global competition. A particular challenge for the EU is to maintain European jobs, prosperity and social and environmental standards. This is true not just because of the economic power of the USA and Japan, but more particularly because of the significant and increasingly strong industrial and research performance of countries such as China (which

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7 European Council, 23-24 March 2007 – Presidency Conclusions (Sustainable Energy).

8 For example: 1) WMO/UNEP Intergovernmental Panel on Climate Change – "Climate Change 2007: The Physical Science Basis - Summary for Policy Makers", or

2) Open letter by 61 Scientists to the Canadian Prime Minister

(http://www.lavoisier.com.au/papers/articles/canadianPMletter06.html).

9 http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm.

10 See CES 838/2002: *Research requirements for security and safety of energy supplies*. See also the more recently published: Transition to a sustainable energy system for Europe – The R&D perspective (ISBN 92-79-02688-7), and Nature, Vol. 444, Issue no. 7119, page 519 (Nov. 2006) "Our emperors have no clothes".

11 See also CESE 583/2006 (OJ C 185, 8.8.2006).

12 CESE 1484/2005 (OJ C 65, 17.3.2006).

13 CESE 583/2006 (OJ C 185, 8.8.2006).

wants to overtake the United States as the most technologically advanced country in the world by 2050 [14]), India and Brazil, and of the significantly lower wages and social and environmental standards in those countries. It is precisely against this background of global competition and of the global race for increased investment in research and development, including global competition for the best scientists and engineers, that the European Union needs to optimise its policies in this area. Thus, we are talking primarily about global competition, not that within Europe.

3.8 **Staying ahead in research, development and innovation.** Europe's competitive position can thus only be maintained if it continues in the future to maintain its lead in research, technological development and constant innovation, rooted in a socio-cultural environment of democracy, the rule of law, political stability and dependability, free enterprise, planning security, motivation and the recognition of achievements. The European Research Area must be strengthened and expanded. Whilst this is now generally recognised in political statements of intent, the reality in terms of action and specific priority-setting (e.g. research budgets) and the relevant regulatory frameworks (e.g. collective agreements[15] and tax laws[16]) shows up significant and regrettable deficiencies, both at Community level and in most of the Member States. Just how dramatic this state of affairs is should not be underestimated, even if some Member States show an encouraging trend towards catching up[17].

3.9 **Top performances in the scientific and technical field**. Top performances in the scientific and technical field, and their entrepreneurial conversion into innovations and a competitive, economic force, are essential preconditions to safeguarding our future, for example with regard to energy and climate issues, preserving and improving our current global position, and developing rather than jeopardising the European social model. All things considered, however, research and development also serve the fundamental aim of bringing about greater and new knowledge. However, increased knowledge not only helps us to solve problems, but also broadens our world view, objectifies conflict situations, and enriches our culture.

3.10 **Reviving tradition**. Europe must now, therefore, become aware that it was once the leading area for research and innovation and aim to revive that tradition. Europe's strength lies in the capabilities and performance of its citizens. More must therefore be done to promote and develop these capabilities than has hitherto been the case. However, this also means investing significantly more in research and development, increasing their efficiency, strengthening the

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14 *Bild der Wissenschaft* 9/2006, p. 109.

15 In particular the income and contractual status of young scientists and engineers.

16 On this subject, see also the Communication from the Commission COM (2006) 728 final: *Towards a more effective use of tax incentives in favour of R&D*.

17 *Frankfurter Allgemeine Zeitung*, number 49, p.17, 27 February 2007: *Zwischen Fortschritt und Stillstand* (between progress and stagnation).

willingness and ability of industry, commerce and government to innovate, promoting and recognising effort, and reducing any obstacles that stand in the way.

3.11 **Increasing investment**. In particular, this means that the EU and the Member States must invest significantly more in research and development, in general education that reflects this, and in educating the required scientists and engineers (of both sexes). Above all, however, it means that the willingness of industry, and in particular small and medium-sized enterprises, to invest in research and development needs to be promoted and made more attractive and profitable through appropriate legal, administrative, fiscal [18] and financial framework conditions.

3.12 **A social climate that favours progress**. The most important prerequisite for achieving this goal is a social climate that is open to progress, innovation and entrepreneurship, in which society fully understands this and all its implications, so that politicians at all levels create the necessary conditions and take decisions that are conducive to such progress, but also so that jobs are created and enough confidence and optimism is built up in industry for the necessary investments to be made. This includes ensuring that the public is made more familiar with the achievements and significance of science and technology and the pioneering work of entrepreneurs than is currently the case. This also means recognising that basic research[19], in particular, lays the necessary foundations for future knowledge and innovations.

3.13 **Recognising achievements**. The decisive impact of these achievements on our current way of life, the conditions in which they came about, and the scientific, technological, entrepreneurial and cultural achievements associated with them, must be recognised by society, taught in schools and accorded the significance they deserve.

3.14 **Further prerequisites**. However, progress and continuous innovation do not depend exclusively on science and technology, but also on the motivation, the skills and the willingness to work of all those involved, as well as on innovative business models, the right management methods, and on a legal framework that is conducive to all of the above.

3.15 **Acceptance of risk**. If promoting new approaches to research, innovative technologies, business practices and business models is to be a success, one must accept that success involves a certain amount of risk, including the risk of losses. Generally speaking, the advantages and effectiveness, or indeed the disadvantages, risks and side-effects of a new approach are only recognised with it has proven itself in practice and in competition with other processes. Even failure provides lessons. Opportunity and risk are two sides of the same

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18 On this subject, see also the Communication from the Commission COM (2006) 728 final: *Towards a more effective use of tax incentives in favour of R&D*. The Committee will draw up a separate opinion on this.

19 See in particular CESE 319/2004 (OJ C 110, 30.4.2004). From a historical perspective, it was proposals for basic research that benefited from the first scientific cooperation initiatives in (Western) Europe. They arose out of the need to build centres for large-scale equipment and to create a critical mass that would have been too expensive for any individual Member State.

coin. As a rule, the expected benefit of an innovation should outweigh the possible risks associated with it. Potential risks to society require a special assessment. Consideration could also be given to whether – at least for small and medium-sized enterprises – a risk fund (for example at the EIB) should be set up to help cover possible losses.

4. Education, training and lifelong learning

4.1 **Knowledge base**. Knowledge is based on two equally important pillars: education and research. New knowledge can only be attained through research and development. For this to happen, existing knowledge is required as a starting point: this must be consolidated and passed on through education, training and lifelong learning. The aims of this are as follows:

4.1.1 **Basic knowledge**. The first aim is to ensure that every citizen has a sound basic knowledge of science, technology and the economy, how they work and their significant basic principles, as part of his or her education. This is essential if, for example, citizens are to be able to make judgements about the often complicated interrelations that need to be understood in order to arrive at an informed political opinion. Accordingly, the curricula and available teaching time at all levels of education should be oriented towards gradually introducing children and young people to a scientific, technical and economic way of thinking and to the store of knowledge[20] that exists, by using concrete examples and clear and stimulating explanations and teaching materials. They should also raise awareness of the significance of science, technological development, innovative socio-economic arrangements and the knowledge society in general to their future and life opportunities. If this is to happen, significantly more emphasis needs to be placed on this part of the curriculum. The Committee welcomes and supports the recommendations of the Rocard report, which addresses this concern[21].

4.1.2 **Incentives for choosing a profession**. At the same time, those who show talent for science and technology should be encouraged to pursue a – notoriously tough – course of study in this area and, with this in mind, be given a solid basis of knowledge with which to start a career in this field. This, too, means that school curricula, especially in grammar schools, should provide extensive, high-quality teaching.

4.1.3 **Regaining lost ground in terms of breadth and depth**. Thus, there is significant ground to be made up in terms of teaching in science and technology. Of course, this does not change the fact that all talents across the spectrum need to be nurtured, including the social sciences, economics, the humanities and the arts. Sound education and training for the masses – which

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20 This is not so much a matter of learning and understanding a large number of formulae, but rather of a basic understanding of technology and the fundamental laws of nature, and also of the significance of quantitative connections and the usefulness of mathematics.

21 **A Renewed Pedagogy for the Future of Europe**, Directorate-General for Research 2007 Science, EUR 22845, High Level Group on Science Education, Michel Rocard (Chair), Peter Csermely, Doris Jorde, Dieter Lenzen, Harriet Walberg-Henriksson, Valerie Hemmo (rapporteur).

also means that pupils need to be willing to work and self-disciplined – is just as important as the education of the academic elite. High-quality educational establishments, from primary schools to universities, are the fundamental prerequisite for society as a whole to be receptive to education and science.

4.1.4 **The European Knowledge Area**. The Committee repeats its recommendation that a common European knowledge area be developed to complement the European Research Area, through closer supranational cooperation in the areas of learning, innovation and research. Obstacles to the single market that are obstructing the transition to the European knowledge society must therefore be removed as quickly as possible. On this subject, the Committee refers to its opinion on *The road to the European knowledge-based society – the contribution of organised civil society to the Lisbon Strategy*[22].

4.1.5 **Lifelong learning and mobility**. Incentives and measures in support of lifelong learning have an important role to play here. Lifelong learning is the key to the knowledge society. This includes still greater support from Member States for personal mobility, and strengthening the relevant, effective EU programmes (Erasmus, Marie Curie). Mobility networks Europe and is conducive to attaining and transferring knowledge. Free movement of workers, researchers and students must be guaranteed and go hand in hand with decent income, working conditions and support for families. Public bodies across Europe also need to improve access to information in this area.

4.2 **Standard of skills training**. This also means that scientific and technological training in universities and technical colleges must, at the very least, match the highest international standards. The most important capital for research and innovation are highly qualified and motivated scientists and engineers of both sexes who maintain and develop their skills through lifelong learning throughout their careers and a sufficient number of whom are capable of taking on leading roles and carrying out pioneering work in the most difficult areas.

4.3 **Opportunities for all**. In the future, progress and success will, more than ever, be the result of structured team work involving division of labour where all those involved have the best possible opportunities to develop and take initiatives in accordance with their talents, skills and creativity. This also means that there needs to be sufficient interchangeability of school systems so that people of all abilities, including, for example, late developers, are given the opportunity of the best possible education. It is also essential to have high-quality training institutions for the whole spectrum of specialists that is and will be needed for the wide range of tasks in technology, science and business.

4.4 **Networking**. Especially for the purposes of vocational training, even closer networking of the training, research and industrial application pillars is needed. There is a clear link here to the subject of lifelong learning and mobility (see point 4.1.5). There is also a need for better cross-

22 CESE 1500/2005 (OJ C 65, 17.3.2006).

border networking of universities and higher education colleges. With this in mind, the Committee welcomes the plans for the European Technology Institute (ETI)[23], which is aimed at further developing the innovation capacity of the EU and its Member States by connecting training, research and innovation activities at the highest level. However, above and beyond education and training, this also applies to all the pre-competitive research and development[24] of industrial firms, such as the joint development of improved engine technology in the car industry.

5. Financial matters and procedures

5.1 **Investment is a matter for all stakeholders**. The EU, the Member States and the private sector must do their best – i.e. considerably more than they do now – to provide the necessary investment for education, research and development.

5.2 **Barcelona target**. The Barcelona target set for the purpose of implementing the Lisbon strategy must be taken very seriously and strenuously pursued by all the relevant stakeholders if Europe is not to fall further behind its global competitors in terms of R&D investment. This target states that total R&D expenditure in the EU should be increased such that it reaches around 3% of GDP by 2010. Two thirds of the required investment is to come from the private sector.

5.3 **Multiplier effect of the Seventh R&D framework programme**. In December 2006, the Council adopted the Seventh R&D framework programme (FP7) for 2007-2013. The budget for this programme, at around EUR 50 billion, was significantly higher than for the previous one. This is another very significant European policy success, which the Committee has substantially supported. However, the total budget for this is about EUR 50 billion, which means that the Community will still only be providing about 2% (in other words, only one fiftieth) of the total investment in research and development aimed for by the Barcelona target. However, as the Committee has repeatedly stressed, this is insufficient to maximise the multiplier and integrating effects that EU funding has on Member States' research funding and much-needed industry investment, and thus bring about the considerable increase that is needed to reach the Barcelona target.

5.4 **Reiterated recommendation**. Therefore, not least in view of the planned establishment of the European Technology Institute (ETI) and the urgent need for more R&D work into climate-friendly, sustainable energy supply, the Committee reiterates its recommendation[25] that this part of EU funding should, as a first step, be increased by half, i.e. to around 3% of the total investment aimed for by the Barcelona target, as part of the revision of the EU budget planned

23 CESE 410/2007, 14.3.2007.

24 See also chapter 7 of CES 595/2000 (OJ C 204, 18.7.2000).

25 CESE 1566/2006 (OJ C 325/16, 30.12.2006).

for 2008. This would be a particularly effective step by the EU towards reaching the increasingly important Lisbon and Barcelona goals more quickly than can be expected at present, and towards solving the above-mentioned problems more effectively and more quickly.

5.4.1 **Competition with China**. The equivalent research efforts being made by China, for example, are increasing rapidly, and Europe must make every effort so as not to lose markets in globally important and essential technologies to international competitors. However, it is not politically credible to demand that the private sector provide the necessary investment when the EU and the Member States have not provided their share of funding for the Barcelona target which they themselves set.

5.4.2 **Core funding by Member States**. At the very least, the Member States should ensure that their universities and research institutes have sufficient core funding to be able to receive the expected level of co-financing from the Seventh R&D framework programme.

5.5 **EU framework for state aid**. EU law on state aid should therefore be framed in such a way as to encourage the Member States and enable them to provide greater, more effective and less bureaucratic support than in the past, for the research and development plans of universities, research organisations and industry, and help them establish networks between them. Careful consideration should therefore be given to whether the *Community framework for state aid to research and development and innovation*[26] really is conducive to these goals.

5.6 **Member States' budget rules**. Individual Member States' budget rules should allow for a more flexible drawing/flow of funds for R&D measures. These should be adapted to the cycle of each project. For instance, it should be possible to transfer allocated funds to the following calendar or budgetary year.

5.7 **Development of scientific infrastructure**. The EESC has also recommended on several occasions[27] that a much greater part of the resources of the EU's Structural Funds be used for the development of scientific infrastructure. The use of funding from the European Investment Bank for this purpose could also be highly beneficial.

5.8 **Potential of SMEs**. It is also important to further strengthen the potential of SMEs, and especially of start-up companies, for innovation and, more generally, to provide stronger incentives for industry to invest in this area. The Committee also refers to its recommendations[28] on the EU *multiannual programme for enterprise and entrepreneurship, and in particular for small and medium-sized enterprises (SMEs)* and to the support for the

26 OJ C 323/I, 30.12.2006.

27 For example in CESE 1484/2005 (OJ C 65, 17.3.2006).

28 CESE 245/2005 (OJ C 234, 22.9.2005).

knowledge-based economy that is especially important in this context. The fact that 98% of all firms in the EU are SMEs makes it particularly clear how important it is to strengthen the capacity for innovation of this category of enterprise. The Committee therefore welcomes the fact that EUR 1.3 billion are set aside for R&D by and on behalf of SMEs within FP7. Existing regulations that make life difficult for SMEs should be reviewed and, where possible, red tape should be cut; the authorities could also, through business angels, provide help with access to funding opportunities. Europe can also draw inspiration from the funding policies of other countries in this area.

6. Structural aspects and basic conditions

6.1 **Reference to other and previous reports**. On this subject, the Committee refers first of all to the two recently-published Commission Communications[29] on innovation and to the excellent Aho report[30]. It also refers to its own opinion[31] on *Unlocking and strengthening Europe's potential for research, development and innovation*, which in many places overlaps with this document, but also goes into much more detail on several of the issues dealt with herein.

6.2 **Innovation is more**. Reaffirming and complementary to the above-mentioned reports, the Committee also reiterates that progress and innovation do not depend exclusively on science and technology, but also on applying such knowledge through new and better products and processes, innovative business models, and the right management methods; thus, an innovative entrepreneurial spirit and entrepreneurial initiatives are also key. Progress and innovation also depend on new kinds of services, on developing healthcare services, and in general on better solutions to social problems – an example of this is the concept of "flexicurity", which the Committee has discussed[32].

6.3 **Innovation – a step into uncharted territory**. Thus, innovation means devising and implementing new technologies, processes, organisational methods, business models, educational models etc. that had not previously been considered. Therefore, their effectiveness can usually only be proven once it has stood the test of real competition.

6.4 **Flexible regulatory frameworks**. At the same time, regulations are drawn up on the basis of existing knowledge. It is therefore very important that such regulations offer sufficient room for manoeuvre – i.e. enough plurality and variability – to give new ideas that were not previously thought of the chance to be put into practice and not to be suffocated at birth or allowed to wither away slowly simply because they do not fit into the framework of existing

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29 COM(2006) 502 final, 13.9.2006: *Putting knowledge into practice: A broad-based innovation strategy for the EU;* COM(2006) 589 final, 12.10.2006: *An innovation-friendly, modern Europe.*

30 EUR 22005 Creating an Innovative Europe ISBN 92-79-00964-8.

31 CESE 1566/2006 (OJ C 325, 30.12.2006).

32 See for example CESE 740/2006, *Flexicurity: the case of Denmark* (OJ C 195, 18.8.2006).

regulation. When drafting legislation, it is therefore important to ensure that fundamental issues are dealt with and regulated, but that excessively detailed regulations are avoided. Overregulation and excessively restrictive rules, however well-intentioned they may be, stifle and hinder innovation. The Committee therefore supports all efforts to simplify regulations and to check them for superfluous and/or unnecessarily restrictive requirements. This also serves the purpose of releasing experts (see below) from unnecessary red tape. Moreover, the mistakes of individuals should not lead to the overregulation of everyone.

6.5 **Freedom of research**. Once again: Innovation requires sufficient entrepreneurial freedom. Scientific freedom – inter alia freedom from restrictive[33] or indeed ideological requirements – is a fundamental prerequisite for creative research and new discoveries and inventions, without prejudice to a) the limits placed by legislative answers to ethical problems and b) the proper use of allocated funds.

6.6 **Reiteration of CESE 1566/2006**. Reference is made to further important observations in the opinion[34] referred to under point 5.1. The statements contained therein are strongly supported. Points 4.7 to 4.11 of that opinion make recommendation on the following topics, which are relevant to this opinion: *Moving from enhancing our knowledge of nature to the creation of innovatory products, processes and services. Mobility between academia and industry. Publicly accessible information systems. Clusters. Start-ups. Basic research. The innovative product. Public procurement. Intellectual property and necessary Community patent. Period of grace prior to publication which does not infringe novelty status. The language problem. Particular situation of the new Member States.*

6.6.1 **Protection of intellectual property - European Community patent.** The particular emphasis is thereby again placed on securing adequate protection for intellectual property[35]: it must be worthwhile for businesses to invest in research, development and innovation, and the financial, legal and administrative outlay required to secure and retain property rights must not adversely impact Europe's economic strength vis-à-vis global competitors. This also shows the urgent need for a Community patent (with a grace period enshrined in it).

7. The human factor

7.1 **Most valuable resource**. First of all, the Committee refers to its specific opinion[36] on this subject and once again reaffirms and underscores the statements contained therein. As it had

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33 See also CESE 1484/2005 (OJ C 65, 17.3.2006), point 4.13.2 on the Charter and footnote.

34 CESE 1566/2006 (OJ C 325, 30.12.2006).

35 On this subject, see also Commissioner Günter Verheugen, SPEECH/07/236 on *Intellectual property – a driving force for innovation in Europe*, 19 April 2007.

36 *Researchers in the European Research Area: one profession, multiple careers.* CESE 305/ 2004 (OJ C 110, 30.4.2004).

already done on earlier occasions, the EESC pointed out in the abovementioned opinion that human capital is the most delicate and most valuable resource for knowledge and innovation. The most important task is therefore to motivate talented young people to embark upon a scientific or technical education and to provide them with the best possible such education.

7.2 **Quality of training bodies (See chapter 4)**. The number, resources and quality of the requisite training bodies are therefore key prerequisites for meeting the demand for good scientists, engineers and entrepreneurs. It is therefore essential to establish and maintain – working in liaison with research and teaching bodies[37] – an adequate number of properly equipped, top-quality attractive universities and, above all, institutes of technology, possessing excellent teaching staff. These universities and institutes of technology must be able to stand up to competition with the best universities in the USA or other non-European states. They must consequently also be sufficiently attractive to draw the best students from non-European countries.

7.3 **Society's responsibility**. By virtue of the investment carried out by society on the one hand, and by individual researchers on the other, with a view to acquiring the desired broadly-based and not readily accessible fundamental knowledge and high-level specialised knowledge, society – as represented by politicians – assumes responsibility for making optimal use of this investment. This responsibility must be reflected in a concern to ensure that trained research workers are provided with appropriate job and professional development opportunities and suitable career paths**,** with attractive options for branching out into other fields, without running the risk of being professionally sidelined or sent down dead ends. If qualified scientists and engineers are unemployed, underemployed or underpaid, this represents a waste of economic investment and deters the next generation of top-level scientists and engineers, with the result that they decide against scientific or technological careers or emigrate from Europe. Excessive bureaucracy (see point 7.7) is also a form of underemployment.

7.4 **Developing talent**. People, including all employees in firms, universities and research institutes, must be provided with the best possible opportunities – in the light of their talents, capabilities and levels of creativity – to develop their gifts and display initiative. We also need to bring about a social climate that makes it possible to start a family and is conducive to and promotes their creativity. At the same time, this also means that the young people who benefit from this training and support, for their part, are driven by a sense of duty and by commitment to make every effort to make the best possible use of the talents and the skills they have learned. These are important issues of social policy, family policy, the academic discipline of business management, and management culture in general. This latter has now recognised the impact of a sensible work-life balance on creativity and productivity[38].

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37 With this aim in view, the achievement of even better networking between universities and non-university research bodies could be helpful, particularly in order to include in such networking the equipment and infrastructure of such research and teaching bodies, but also to allow the latest knowledge to be taught.

38 See *Frankfurter Allgemeine Zeitung*, No. 257, 4 November 2005, p. C1.

7.5 **Identifying and assessing high achievers**[39]. Outstanding skills and achievements cannot properly be assessed by quantitative indicators, which are in any case subject to abuse. For example, a problem is posed by those scientific authors who like to quote each other in their publications, thus forming quotation cartels and gaining advantage in assessments based on quantitative indicators. As evaluation criteria, neither the number of publications nor that of quotations, patents or other key figures are sufficient or stand up to scrutiny; quality, novelty value and significance are more important. Moreover, it has sometimes been the case that the most groundbreaking discoveries or inventions were recognised, acknowledged, used or quoted only after a certain delay. Therefore, in order to assess personalities and achievements, with all their characteristics and facets, we need the wealth of experience and personal judgement (though even then misjudgements cannot be totally avoided) of the key representatives of the relevant area of expertise in which the achievements have been made or are expected.

7.6 **Involvement in decision-making processes**. It is also necessary to involve experienced experts and scientific and technical achievers more than hitherto in relevant decision-making processes and administrative dossiers relating to research policy, entrepreneurial and innovation policy matters. The establishment of the European Research Council (ERC) is a very encouraging first step in this direction, which the Committee has strongly supported[40]. However, sufficient relevant expertise also needs to be attracted to, and retained for, the administration of EU (i.e. the Commission in particular) and Member State bodies that provide funding for research and innovation. In particular, this should involve successful young engineers and researchers. Support for research and innovation needs to go beyond mere administration.

7.7 **Freedom from the burden of too many non-core tasks**. Research, development and inventing are activities that require a lot of time in terms of mental effort and laboratory work, as are consolidating and passing on knowledge. These activities need time for undisturbed concentration and reflection. Since 2000, the Committee has repeatedly pointed out[41] that the ever increasing and excessive amount of committee work, application and approval procedures, report writing, bureaucracy in general, etc. now takes up the greater part of many experts' time. It thus takes them away from what they should really be doing and is detrimental to the ability to innovate and the effectiveness of the very people who are

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39 See also CESE 305/2004 (OJ C 110, 30.4.2004).

40 See also CESE 319/2004 (OJ C 110, 30.4.2004).

41 In particular, see point 9.8 and sub-points of CESE 595/2000 (OJ C 204, 18.7.2000); for example, this states in point 9.8.2: " Consequently any successful scientist has only a limited capacity for interaction - and a limited period of time - available to use and interpret contacts with other people, groups, bodies, committees, etc. without reducing his or her scientific productivity. Too many and too costly application and approval procedures - particularly if they are unsuccessful - deprive research of input from the people it needs. This is particularly the case given that there are many funding instruments and evaluation procedures, which often overlap, for a given project."

outstanding in their field. This undesirable state of affairs is now increasingly being criticised in the media, too[42]. The Committee welcomes the Commission's stated intention to address this issue and to join with the Member States in seeking ways to relieve this burden. The call for experts to be involved in decision-making processes relating to research policy does not contradict the need to unburden them from bureaucracy; it may even help achieve this end. A specific goal should be to harmonise and consolidate the numerous application, reporting and monitoring procedures for the various grant-awarding bodies, partner institutions, networks, and monitoring and approval bodies. This would also bring benefits in terms of significantly greater transparency.

7.8 **Brain drain and mobility**. There are good reasons (see also point 4.1.5) for engineers and scientists needing professional mobility and flexibility. However, this should not be at the expense of personal and family life or of social security[43]. Moreover, it must not lead to net emigration of the best people from Europe. Therefore, working conditions within Europe must be sufficiently attractive to prevent this and, at the very least, to lead to an overall balance in the mobility of highly-qualified achievers. At the same time, some Member States are concerned that a one-way brain drain could take place within the European Union. Therefore, as the Committee has repeatedly recommended (see also point 5.7), a significantly larger proportion of the EU's Structural Funds should be used for developing scientific infrastructure so as to create attractive research locations in all Member States that will then attract people back to their home countries and, at the same time, be able to partner within networks.

42 See, for example, *Frankfurter Allgemeine Zeitung*, No. 60, 12 March 2007, *Ein Forscher geht*; and also No. 67, 20 March 2007, Interview with Harald Uhlig.

43 See also CESE 305/2004 (OJ C 110, 30.4.2004).

7.9 **Professional image of entrepreneurs**. Turning research and development into industrial products and processes raises a particular set of issues. The Lisbon target of two-thirds of research funding coming from industry is not without reason. It is therefore particularly important to enhance the professional image of entrepreneurs and to raise public awareness of their key role in innovation, economic progress and prosperity in general. For this reason, the Committee, as the bridge to organised civil society, has put entrepreneurship with a human face at the centre of its forthcoming work programme. Only through responsible and energetic entrepreneurship that is able to develop freely will the Lisbon goals be achieved.

Brussels, 12 July 2007.

The President of the European Economic and Social Committee	The Secretary-General of the European Economic and Social Committee
Dimitris Dimitriadis	Patrick Venturini

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N.B.: Appendix overleaf.

APPENDIX
to the EESC's own-initiative opinion

Contributions of the national economic and social councils

Contribution of the Belgian Central Economic Council

Within the Central Economic Council (CEC), the social partners are discussing various subjects of central relevance to the Lisbon strategy. Since the 1996 law on promoting employment and preventive safeguarding of competitiveness, the social partners have been engaged in an in-depth analysis of the main elements determining wages and structural competitiveness factors in our economy. The results of this work can be found in the technical report on maximum available margins for increases in wage costs, used as a basis for biannual inter-sectoral negotiations.

The Council would point out that each time the wage margin is set in successive inter-sectoral agreements, account is taken of the various economic shocks experienced by Belgium and socio-economic changes in neighbouring countries. The most recent inter-sectoral agreement (ISA) was entitled "For an innovative economy and employment". It followed on from three preceding agreements, on adjusting the index (01/2006), the declaration on competitiveness (03/2006), and the agreement on reducing employers' payments and adjusting social allowances to increasing prosperity (09/2006).

The social partners agreed on and reaffirmed their determination to ensure stricter application of the 1996 law on promoting employment and preventive safeguarding of competitiveness. They recommended that, within the framework of the 2007-2008 ISA, sectors which had not yet done so should negotiate a correction mechanism to prevent excessive wage rises and the conversion of savings on employers' payments into higher wages. The inter-sectoral social partners agreed that a balance had to be struck between, on the one hand, keeping the growth of wage costs under control and, on the other, employees' purchasing power.

Officially, since the inter-sectoral agreement of 1998, the social partners have attached particular importance to continuing training, and they have set an objective of 1.9% of total wages on training measures. Since then, a chapter of the Central Economic Council's technical report has been devoted to evaluation of such training measures. In the course of joint work by the CNT (Conseil National de Travail) and the Central Economic Council, the social partners have developed a tool for evaluating these training measures. For them, vocational training must be a key issue for sectoral negotiations in 2007-2008. They are urging sectoral employers' and trade union negotiators to take appropriate initiatives enabling Belgium to catch up in this area.

For several years, the social partners have expressed their determination to pay particular attention to *structural competitiveness*. The most recent and inter-sectoral agreement tasked the CEC with continuing its analysis of this subject. Significant work is underway in collaboration with the Belgian

Federal Science Policy Office, the Federal Planning Office, and various academics, by means of a network involving federal and regional players. This work has produced a diagnosis of the Belgian national system of innovation in the form of an opinion submitted to the government.

In implementing the joint declaration of 27 March 2006, the CEC has organised a conference to explore the factors behind underperformance in terms of innovation and discuss possible solutions. Based on the conclusions of this conference, the social partners intend to take steps to achieve a culture of innovation, both within companies and at the level of public authorities and society as a whole. They feel that an important requirement for this to happen is the involvement of all stakeholders - and therefore all social partners - in the formulation of innovation policy. Indeed, in countries which have succeeded in the field of innovation, national consensus on the importance of a strong innovation policy has helped to develop a strategic vision and an effective innovation system. They emphasise that a culture of innovation does not only depend on the level of expenditure on research and development but also on numerous other aspects: employees' training, the organisation of work, human resources policy, as well as the involvement and support of all employees; wage costs, mobility and career prospects for researchers, patent award systems, and contacts with research institutions. The CEC has also been requested to review innovation efforts by individual sectors and the problems which they are encountering, and to develop useful indicators. The social partners are currently working on a second opinion on policies which could improve our national system of innovation. To this end, the CEC has set up four working groups, tasked respectively with carrying out an analysis of patenting and standardisation issues; the exchange of knowledge, firstly between companies, and secondly between academia and industry; entrepreneurship; and fiscal conditions for research and development and the policy mix. At the request of the social partners, the CEC and the regional economic and social councils have decided to encourage the exchange of information on best practice between regional, federal and European levels. A joint seminar of the Central Economic Council, the FPS Economy/Energy and the European Economic and Social Committee will be held in 2008 on "energy policy, structural competitiveness and sustainable development: energy technologies and innovation".

In addition, the social partners issued an opinion in December 2005[44] and an additional opinion in April 2006[45] on energy efficiency in the housing sector, as a follow-up to the opinion of 2004 on the proposal for a European directive on energy efficiency and energy services. These opinions were intended to ensure better understanding of household energy consumption practices and socio-economic and technical factors behind changes and resistance to change in the field of energy consumption in the residential sector. At present, the CEC and the regional economic and social councils are setting up a round table on this subject.

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44 CCE 2005-1391 avis relatif à l'efficacité énergétique dans le secteur du logement en Belgique (opinion on energy efficiency in the Belgian housing sector) (21/12/2005).

45 CCE 2006-422 avis complémentaire à l'avis relatif à l'efficacité énergétique dans le secteur du logement en Belgique (additional opinion on energy efficiency in the Belgian housing sector) (19/4/2006).

Over the last few months, the CEC has begun work on the subject of improving energy efficiency in transport. A diagnostic opinion[46] on commuting was adopted in 2007. This paid particular attention to emphasising best practices negotiated or supported by the social partners to improve commutes.

In collaboration with the European Economic and Social Committee and the Federal Planning Office, the CEC has carried out a series of studies and held a seminar on reforming network industries. These studies are included as part of the work of the CEC's energy and transport sub-committees. The CEC has a work programme on energy, covering four subjects: energy supply; the contribution of the energy sector or to competitiveness, growth and employment; liberalisation of the energy market in the EU and Belgium; and potential in the field of innovation, research and development. The CEC has adopted an opinion on the Commission's preliminary report on "Energy 2030"[47].

As part of negotiations on the Inter-Generational Pact, the social partners introduced a link between the sustainability of public finances, employment rates, and upgrading social services to the level of prosperity. In implementing an agreement of September 2006 within the Group of Ten, the CEC and the CNT adopted a joint opinion[48] on a mechanism for adapting welfare payments to prosperity.

Finally, for the last few years a current affairs monitoring unit has been operating within the CEC. This unit will enable the social partners to select issues which are appropriate for discussion and will keep them in touch with the main developments on the Lisbon strategy. The unit is developing a cooperation network with academic experts and several Belgian representatives to European authorities, whether political decision-making institutions or consultative bodies. Regular hearings are held at the level of the CEC, involving the Belgian permanent representation to the European Union as well as Belgian representatives on the Economic Policy Committee and the Economic and Financial Committee.

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46 CCE 2007-127 avis diagnostic sur les deplacements des travailleurs entre leur domicile et leur lieu d'activite professionnelle (diagnostic opinion on commuting) (30/1/2007).

47 CCE 2007-357 avis concernant le rapport preliminaire de la commission « energie 2030 » (opinion on the commission's preliminary report on "energy 2030") "Belgium's energy challenges towards 2030 " (1/3/2007).

48 CCE 2006-1022 liaison au bien-etre - bonus annuel de bien-etre pour les pensions - diminution des charges patronales - execution du pacte de solidarite entre les generations (linkage to prosperity - annual prosperity bonus for pensions - reducing employers' payments -implementing the pact for inter-generational solidarity) (21/9/2006).

Contribution of the Bulgarian Economic and Social Council

Investment in knowledge and innovation

The situation in Bulgaria

Knowledge and innovation policies aim to increase the potential and competitiveness of the Bulgarian economy. State participation in governing the innovation process is aimed at creating conditions and developing mechanisms for investing in practical research and the launch and dissemination of innovative production methods, as well as acquiring new knowledge and skills.

In 2005, Bulgaria was ranked 26th (of 33 countries) by an innovation index chart. This put us among the undeveloped countries. The main areas in which Bulgaria lags behind are the share of private investment in R&D, five times less than EU-25 figures, the share of high-tech products in export (16% of the EU-25 average) and life-long learning. Unlike the EU-25, where the ambition is for the private sector to finance two thirds of R&D spending, in Bulgaria the State provides the majority of this funding. In 2004, only 16.4 % of companies were innovative, and the highest share is of firms working on product innovations (44.8%). Given the risks involved in R&D spending, the share of companies working in ICT, architecture and engineer sciences is only 6.46% of all the companies in the country (39.9% of innovative companies).

When we look at the number of patents that people apply for, this figure is unsatisfying as well - in Bulgaria it is 4.3 for every million people, while in the EU-25 it is 136.7. The overall innovative structure is undeveloped. There are few innovative services and most companies do not want to use innovative consultants. There is a considerable disparity in the supply and demand for highly qualified specialists.

The main documents regarding policy in this area are the Bulgarian National Innovation Strategy, and OP "Development of the Competitiveness of the Bulgarian Economy 2007-2013". The research capabilities and financial resources of the country should be concentrated on areas in which Bulgaria has the best chance for development:

- information and communication technologies (ICT) – a field in which Bulgaria already has the necessary highly-qualified research potential;
- genetics, proteomic and medicine;
- plant and animal genetics and bio-technologies;
- precision machinery;
- development and application of modern technologies in classical and atomic energy;
- nanotechnologies and micro-electronics.

Lack of appropriate funding sources is the biggest obstacle confronting company managers, because investment in the creation of a new product, technology and their introduction to the production process is risky. The National Innovation Fund (NIF) is responsible for encouraging entrepreneurs to

invest in R&D. The main objective of the Innovation Fund is to increase the competitiveness of the Bulgarian economy by stimulating R&D in innovative market-oriented products in any sector in Bulgaria. Business R&D investment is stimulated by subsidising a percentage of the total R&D investment in certain company projects. The basic principle is that 50% of the costs of research projects, 25% of the costs of development projects and 50% of the costs of feasibility studies are subsidised. In 2006, BGN 8 000 000 was spent on new products and technologies and in 2007, the sum is forecast to come to BGN 13 000 000; for 2008, it will be BGN 20 000 000 and in 2009, it will be BGN 40 000 000.

The main objective of the operational programme to develop the competitiveness of the Bulgarian economy is the development of a dynamic economy which is competitive in the EU and international markets. One of its specific objectives is to encourage innovation and increase the efficiency of companies by:

- Providing support for technological start-ups
- Improving pro-innovative business-support infrastructure
- Increasing innovation capacity of companies through stimulation of knowledge dissemination
- Easing the conditions for SME credit
- Ensuring funds for high-risk investment
- Improving access by SMEs to pro-innovation networks and services
- Ensuring better accessible and qualitative consultancy and information services for business.

ESC proposals

The State has presented guidelines for promoting innovation in SMEs. Until now, the State has established an institutional framework and a legal and regulatory environment, but has not provided clear indications for access to funding. SMEs suffer from a lack of sufficient information and the financial and human resources necessary to create innovative products and implement information and communication technologies. In order to stimulate investment and opportunities for developing R&D, the ESC proposes that measures and approaches be drawn up to provide easy access for SMEs to venture capital facilitating the introduction of information and communication technologies. Taking into consideration the role of the capital market as an alternative source of financing, the ESC recommends that the Bulgarian legislation regulating capital market activity within the country should be improved, easing the requirements relating to public offers and encouraging the listing of SMEs on the stock exchange market.

EU practice shows that micro-financing is also an appropriate way of funding innovation in SMEs. A State policy could be drafted to stimulate micro-financing for innovative activity by SMEs in areas lagging behind in their economic development. This would help overcome accumulated regional imbalances in economic and social development, as well as the concentration of production and employment in certain areas of the country.

The Bulgarian government's priorities include achieving sustainable growth and improving the competitiveness of the economy. Innovation is a vital factor for long-term economic growth. In Bulgaria, R&D spending is approximately half a percent of the Gross Domestic Product (GDP), putting the country near the bottom of the list of EU Member States. So as to stimulate innovation activity of SMEs, a mechanism should be developed to promote scientific projects in industry, and the interrelation "education – research - innovation" should be activated for the effective transfer of scientific knowledge into practice. As regards stimulating R&D, the ESC recommends that details should be given on sources of funding from the National Investment Fund, and that the areas and priorities supported by the NRP should be clearly identified. This recommendation is based on analyses of the implementation of the Lisbon Strategy in the 25 EU Member States where 2/3 of R&D spending is provided by business. Therefore, the NRP should stipulate the conditions and incentives for private sector funding for R&D.

The ESC of Bulgaria considers that there should be a new beginning for the innovative strategy of the Republic of Bulgaria, and the measures underlying this new beginning should include:

- implementing transfer and mediatory services for industry;
- implementing specific measures to stimulate "hunger" for high-technology innovation in industry;
- re-establishing the relationship between business and university education and science;
- pursuing state policy oriented to the "generators" of innovative decisions;
- developing mechanisms for financial promotion of university potential;
- furthering the work of the National Council for Innovation as regards coordinating the activities of all parties concerned in the transfer of technologies.

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Contribution of the Greek Economic and Social Council

INVESTING IN RESEARCH AND INNOVATION

There is a pressing need to direct and support production that centres on knowledge-intensive products and services, quality and innovation, in other words on a production model where competitiveness does not depend on the low cost of inputs or the low salaries of workers, but on qualitative factors.

Major changes are needed to support innovative entrepreneurship, so as to nurture competitive companies and give a real boost to employment. The basic approach is to secure new knowledge inputs that can fuel innovation with regard to products, technology and organisational structures. The EESC has suggested in several opinions [49] that for this to be feasible there are a number of preconditions:

- Conditions must be improved in order to make cooperation between universities/research centres and businesses more attractive and to encourage companies to undertake more research-related activities.
- Priorities should be reordered so as to match research to the needs of society and the knowledge-based economy and to support independent research.
- Another important area is the definition of targets for the improvement of school and university curricula. A system should be established for the evaluation of educational institutions and research bodies. This ties in with the establishment of specific targets for the education system in relation to society and the economy. As regards the evaluation of higher educational establishments, the ESC would like to point out that any evaluation process must be based on academic criteria and respect the institutional, administrative and economic independence of universities.
- The basic priorities for research policy should be to reorganise the research system so as to improve its development results and to increase and make better use of available resources.
- Additional measures are needed to improve the institutional framework and strengthen mechanisms for the productive use of research findings, with the aim of boosting the application of research in the private sector while also encouraging innovative investment initiatives. In this sense, it will also be important to adopt measures promoting mechanisms to acquire knowledge appropriate to Greece's situation from more technologically advanced countries.
- The fact that Greece lags behind in use of information technology in the home and at work must be seriously addressed. In addition to the economic implications, connecting the country and the regions through the internet is also relevant to social policy in terms of equal opportunities at central and regional level. There is a need to assess the results to date of the strategy followed by Greece (the main player here being Koinonia tis Pliroforias A.E), the investments made and the role of the public and private sectors, as well as the cost of services. Appropriate regulatory measures must be adopted in order to avoid the formation of monopolies in this area, to secure

49 Opinions 121 and 140.

low-cost access, particularly for certain population groups (e.g. young people, the unemployed), and to protect consumers.

- The EESC notes the need to build on measures and policies that aim to bring small and medium-sized companies online and to encourage their involvement in research and the information society. There is an urgent need to put together a complete plan in conjunction with the social partners for supporting and integrating research and new technologies in small and medium-sized enterprises, as this would surely have a positive impact on the competitiveness of the Greek economy.

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Contribution of the French Economic and Social Council

INVESTING IN KNOWLEDGE AND INNOVATION

In recent decades our societies have witnessed a hitherto unprecedented revolution. Increasingly powerful and user-friendly tools make it possible to continually expand the production of goods and services. Moreover, these tools have migrated from our working lives into our daily lives.

The computer is an instructive example of this phenomenon. Within a few decades, ENIAC evolved into the PC, with its vastly improved technological capabilities being made available to millions at generally affordable prices. What was once perceived as a strategic working tool is now considered to be a games machine with software that we describe as "user-friendly" and which will soon be available on telephones that most of us, and young people in particular, will own in a range of models.

There are no real precedents for the upheavals experienced across all scientific and technological sectors. In this light, one example worth noting is the life sciences. The range and depth of our knowledge of the human being represent amazing progress, but the application of this knowledge raises moral questions. How far is too far? This is the vital question that presents itself in the context of bioethical legislation.

The massive increase in the variety of these tools has in many ways propelled the vast majority of people into what we term a knowledge-based society insofar as they give access to knowledge on a wider scale than ever.

Economic and social development has now become dependent on the application of different types of know-how, and the creation, acquisition, cross-use, transfer and exchange of information.

Growing bodies of information and the ease with which they can be disseminated, the use of increasingly powerful and user-friendly tools have led to changes in the productive process. A society is emerging where the power of the neuron is gaining ascendancy over physical strength and where the key source of wealth lies in the ability to create.

The European Union set itself an ambitious goal when in 2000 it adopted an action plan to turn itself into the most competitive and dynamic knowledge-based economy in the world by 2010. This goal must be reached at a time when new regions of the world are claiming an increasingly larger share of world prosperity. The European Union is now forced to pit itself not only against North America or Japan in the race towards excellence through scientific and technological innovation, but also against China and India, and soon the continent of South America. Thus it is quite easy to identify the steps that European society must take in order to contribute to the harmonious development of the planet.

§ greater emphasis should first be placed on training, since it is the key to lifelong success;
§ the sciences and scientific careers should then be made more attractive, especially to girls, and a scientific culture should be instilled in everyone, irrespective of their choice of subject

streams. Science is the core knowledge of the knowledge-based society underpinning the knowledge-based economy;

§ research, irrespective of whether it is fundamental, applied or derivative, should then be made a priority and its effects should be put to the best possible use;

§ technical and technological innovation should then be strengthened by involving as many people as possible;

§ finally, a knowledge-based and innovative economy cannot be developed unless interaction between knowledge brokers and EU citizens is guaranteed on a set of issues, including the governance of science that follows naturally from a knowledge-based society.

1. **Step up training efforts by all and for all**

Providing a minimum level of scientific and technical training in and through new communication tools should be considered an absolute priority. Schools have a duty to introduce pupils as early as possible to the skills they need to access knowledge that will become indispensable to them later on in their professional and private lives.

Schools should continue to teach and pass on skills, with digital literacy becoming a basic learning skill. Above all, schools should develop the individual's ability to use, enrich, appreciate and/or put their scope into perspective. In short, schools should be teaching all their pupils critical thinking. This aptitude is crucial in a skills-based and knowledge-based society. It justifies sustained investment and should not be limited to scientific and/or technical knowledge. The first learning phase is the stage when the family is fully involved in their children's education. This justifies strengthening links between schools and families.

Finally, training cannot be confined to childhood or adolescence. It is also necessary to think in terms of lifelong learning. Indeed, lifelong learning, not only for vocational but also for more general purposes, should be a prerequisite for the success of everyone's personal development. It is one of the most important ingredients of the "good life" spoken of in ancient times. With regard to our working lives, the validation of training, experience, and skills passed on within the work teams of "learning organisations" has to be developed.

2. **Promoting research**

The EU needs to prioritise investment in research. Since it lacks several types of material resources, the European Union should focus on its intellectual capital and hence on research and innovation. The frontline role it has given itself in terms of developing future energy sources, space research, maintaining our planet's fragile balance, and areas as crucial as the life sciences and nanotechnologies… demonstrates that its members have no intention of allowing the United States and Japan alone to define our future.

The European Union therefore needs to see itself increasingly as a common area of research and innovation. For this reason, there is an urgent need to reverse the ongoing tendency and to invest

heavily in research for the dual purpose of achieving a knowledge-based economy and applying that knowledge. Everything points in that direction, not least the quality of researchers but also the EU's cultural diversity.

In addition to the FP RTD, whose usefulness is undeniable insofar as they give structure to the EU's R&D efforts, it would also be appropriate to launch a number of strategic research programmes of proven relevance. These programmes – three or four of them - having been carefully selected for their fundamental nature etc. …., would then receive funding (non-FP RTD) which would demonstrate the reality of the European Union's existence. They might be "federating" programmes in key areas and could open the way for international cooperation. In order to ensure that the relevance of these programmes is appreciated by everyone, they should have a rapid impact on EU industry. They could even contribute to meeting the Lisbon Strategy's objectives, which sets investment in research at 3% of GDP.

3. Fostering and facilitating technological innovation

Technological innovation or organisation is central to industrial strategy with increasingly intricate interconnections between basic and applied research. An economy's competitiveness lies in the ability of its industrial or service components to respond rapidly and efficiently to the needs of the market. This ability presupposes the development of new production or processing know-how.

Several conditions have to be met for innovation to fuel the economy. Firstly, information should be widely disseminated, from large-scale to small producers, and as many stakeholders, researchers, industrialists as possible should be involved in developing a broad range of synergies among themselves. At the same time, a favourable environment is required, i.e. a financial (banking) environment conducive to risk-taking. The United States has manifestly succeeded in meeting some of these conditions, not least importantly fostering synergies between university research and industrial application (e.g. start ups) and the establishment of a specific framework for SMEs whereby a percentage of public spending is earmarked for these businesses. We also need to learn to evaluate the economic impact, especially in terms of productivity, of new software tools in the light of forecasts, expected outcomes and social impact. Innovation will become all the more widespread if a genuine European industrial property policy is put in place, without restrictions. Similarly, harmonisation policy is strategic to the promotion of innovation.

4. Placing the concept of progress at the very heart of society

Belief in the benefits of scientific and technological progress has long been a hallmark of our societies. This began during the Renaissance and picked up during the 19th Century (on both sides of the Atlantic). This perception of steady progress was, to say the least, undermined by the tragedies our continent experienced during the 20th Century. It gave way to a sustained sceptical, even fearful perception, if not at times outright rejection, of progress.

Recourse to the Precautionary Principle, whereby "lack of full scientific and technological certainty at a given time shall not be used as a reason for postponing cost-effective and proportionate measures to prevent serious and irreversible environmental degradation" (Article L 110-1 of the French environmental code), is justified. However, this reasoned action approach often metamorphoses into a principle of abstention, opening the way for all sorts of obscurantism.

A knowledge-based society, one where innovation is allowed to evolve, i.e. a society of progress, presupposes that the general public is not left in ignorance of the questions that present themselves to scientists, and that the latter debate daily.

We therefore need to create a space where experts and the public can get together and talk. When these meetings occur, they prove that the public is willing to understand the experts' hesitations and that the latter are willing to listen to the public's concerns and aspirations. Discussion forums do exist but their development should be encouraged. For instance, economic and social councils should host these debates, which are pivotal the development of a knowledge-based society.

Without technical progress there can be no social progress, mainly because there will be no new wealth to share.

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Contribution of the Italian National Economic and Labour Council (CNEL)

(Commission for labour and production-sector policies (II))

Reference framework

The structure of our production sector is characterised by a prevalence of small and medium-sized enterprises (approximately 90%), specialised in the mature non-high tech production sectors, where we will presumably be more vulnerable to the emergence of the newly industrialised countries.

As a result, one of Italy's main priorities is to help its production sector to expand in size, adopt more structured business models, and shift emphasis to high-tech and medium-to-high tech sectors. More specifically, it must encourage the dissemination of methods, tools and organisational models to promote the presence and strengthen the ability of small businesses to compete on international markets.

The main factors for change in the current international framework are the development of new information technologies and the rapid growth of the emerging economies. Science, technology and innovation have become key factors for economic growth in advanced as well as developing economies.

If our country is to emerge successfully from its present predicament, it will have to adopt innovative policies. The government will have to set market competition rules and priorities as well as allocate resources using a targeted approach (firstly, by focusing attention on research and development requirements and opportunities for internationalisation and promoting the growth and integration of firms).

A strategy for relaunching competitiveness should include a mid to long term programming process linking R&D policies with education and advanced training policies – thus achieving a consistent approach across all knowledge-based fields – as well as with wider policies for developing production and employment.

Another key aspect is to better define the governance of the system. This is key to involving the many institutional and social stakeholders, integrating policies, allocating and re-allocating resources, ensuring consistent and effective investment, and monitoring and verifying results.

National government measures are currently too fragmented, and are sometimes uncoordinated and often contradictory. This results in duplication and reduces the effectiveness of investments. It is therefore of the utmost importance to develop a stable and regulated form of inter-ministerial coordination for the integrated mid to long term programming of priority objectives and resources (EU as well as national), coordination of management criteria and procedures, and coordination of the monitoring and evaluation of results.

It would be appropriate for the country's economy, to programme a limited number of large projects focused on major sectors chosen in accordance with EU technology programmes and initiatives.

In addition, the public authorities should be given a strong role: firstly, as they generate broad, high-level public demand which, as in other high-tech countries, is able to drive entire market sectors; secondly as they are responsible for innovating administrative systems and public services, first and foremost those for individuals and businesses, and this translates into efficiency and lower costs for businesses and a better quality of life for citizens.

In this framework, granting the regional authorities responsibilities in the field of industrial policy and shared legislative powers with regard to research and innovation in the production sector would then become an interesting proposition providing that their objectives and implementing arrangements were clearly defined. The regional authorities are indeed able to play an important role in harnessing research and the transfer of technology, both through financial measures and by setting up coordination networks for research institutes and businesses operating in the same region, based on a close analysis of development potential and existing attitudes.

With regard to resources, a programme should be set up for R&D funding that could gradually be increased so as to reach the EU average within a specified period. Resources should be allocated to upgrading infrastructure (universities, and research institutes and centres) and advanced training and research activities, fostering greater private investment in R&D and co-financing participation in EU programmes and projects.

The Community guidelines for 2007-2013 identify four priority objectives for improving investment in research and technological development: strengthening cooperation between businesses as well as between businesses and public research institutes and institutes of higher education by encouraging regional and transregional groupings of excellence; supporting the research and innovation activities of SMEs by giving them access to the RTDI services (research, technological development and innovation) of publicly funded research institutes in order to make them more competitive and enable them to operate on international markets, especially by benefiting from internal market opportunities; supporting regional crossborder and transnational initiatives to strengthen cooperation and build research capacity in the priority sectors of the relevant EU policy; further developing R&D, especially with regard to information and communication technologies, research facilities and human capital in areas with high development potential by promoting entrepreneurship, facilitating the establishment and the development of new businesses and promoting innovative businesses (spin-outs and spin-offs from research institutes and firms) through technological diversification.

Furthermore, the programming of resources in our country should benefit the frontier sectors, where Italy is in a position to compete and interact with EU activities and programmes, with particular reference to the FP7. It is therefore necessary to define a strategy to facilitate private investment in research through a broad range of instruments that would be fiscal (and, more generally, regulatory) on the one hand, and geared to developing close public-private synergies, on the other hand.

One concrete initiative could involve new financial instruments for innovation. This is an area of highly specific actions where the regions are already active through institutions and instruments (primarily regional funding budgets and guarantee funds) that are able to support private sector activities, without duplication or substitution. The modern management of advanced financial instruments, guarantees and venture capital measures as well as new financial instruments tends increasingly towards rigorous financial assessments. The inclusion of technological ratings supported by public sector measures in management could lead to a significant modernisation of policies supported by private investment and a strong leverage effect on public resources.

In order to overcome the restrictions imposed by the current national organisational structure we need, as experience in Europe has shown, to gain the support and involvement of all stakeholders. The assessment should contribute to establishing collective and cumulative "strategic intelligence" as an instrument for sharing know-how and knowledge (not always conscious or consensual) and negotiating among operators in order to produce results that will make it possible to fine-tune ongoing or future initiatives and help to draw up appropriate development models.

One priority here must be to set up structured regional networks for consolidating competitive advantages, also by providing access to high-quality human, financial and logistical resources. Establishing networks facilitates the development of close-knit relations between those who use and those who possess technological know-how, which enables businesses, including SMEs, to remain in constant touch with research and training centres in the region and hence to innovate continually.

Measures should focus on increasing research activities in the public and private sector, but above all they should seek to develop the practical application of research results. To this end, action has to be taken to increase available resources and, above all, allocate them on the basis of objective assessments of the results obtained and their impact on development.

One instrument for creating a network for formal and informal contacts is the "technology district", which is becoming a potentially crucial driver for innovation, not only through the direct transfer of new expertise and technology but, more importantly, through the close ties that grow up between businesses in the same network; the network becomes a storehouse of knowledge and expertise and, more importantly, a virtual centre for privileged contacts with prospective suppliers and clients. The fabric of relations then becomes more competitive as it provides businesses with an integrated set of opportunities.

In addition, the need to create "knowledge infrastructures" and promote innovation reflects the Lisbon goals, which call on Europe to assume a leading international role by becoming "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion".

Proposals

The following are some short, practical proposals for promoting the dissemination of methodologies, organisational models and innovative technologies for enhancing national production:

- speed up the establishment of a stable inter-ministerial coordination mechanism for the integrated mid to long term programming of priority objectives and resources (EU as well as national), coordination of management criteria and procedures, and coordination of the monitoring and evaluation of results;

- define large technological projects focused on major sectors and regions that can drive the country's economy, linking them directly with EU programmes and technology initiatives, and directly involving the regions in order to make optimum use of each region's particular asset; and simultaneously set up "national networks" of public research institutes, universities and businesses in order to provide effective input to the European network of research and development facilities;

- introduce specific measures for industrial research:

  - tax credit corresponding to 50% for private orders placed with the public research system;
  - tax credit corresponding to 10% of the total research costs of businesses for a period of at least ten years;
  - fiscal measures to support the establishment and development of new high-tech businesses: total exemption from social security contributions for all research personnel employed by technology start-ups during the first eight years of operation, and exemption for all personnel for a three-year period;
  - a mid to long term programme for financing a limited number of "catalyst" industrial projects;

- strengthen and rejuvenate the public research system by making the best possible use of opportunities recently made available under the Finance Act in order to redistribute responsibilities and open up prospects for the best performers, who should be able to rely on concrete employment and career development opportunities;

- develop an appropriate assessment process with a view to improving resource allocation and making best use of areas of excellence;

- set up structured regional networks to enable businesses to consolidate competitive advantages (also by providing access to high-quality human, financial and logistical resources), and to remain in constant touch with research and training centres in the region and hence to innovate continually;

- showcase positive examples of "technology districts" as drivers for innovation, and as virtual centres for exchanging knowledge and technologies between prospective suppliers and clients operating in the same network;

- streamline the interface bodies between research and businesses and assess the effectiveness of their activities in order to make the best use of their resources and skills.

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Contribution of the Maltese Council for Economic and Social Development

INVESTMENT IN KNOWLEDGE AND INNOVATION IN MALTA[50]

Upon entry into the European Union, Malta has faced a number of new challenges. The Lisbon Strategy presents a number of these related to a number of measures which member states must adopt in order for the EU to become "*the most competitive and dynamic knowledge-based economy in the world"* by 2010.

Malta's performance in innovation

Malta's innovation scoreboard indicates a highly mixed record of performance due to Malta's historical and cultural legacy of limited investments in science and technology and the lack of critical mass due to its small size. The European Innovation Scoreboard (EIS) has highlighted the fact that paradoxically despite low input indicators in terms of number of Science and Technology (S&T) graduates, R&D expenditures, and SMEs innovating in-house, Malta ranks very high on innovation and ICT expenditures and certain output indicators such as exports of high-tech products and employment in medium to high tech manufacturing. This is due to Malta's success in securing and retaining high-tech FDIs, largely relating to its excellent human resources.

The EIS highlights the need for urgent investments in the Innovation drivers, particularly in terms of Science and Engineering graduates, and in Knowledge Creation in terms of public and business R&D expenditures, public funding for innovation and University R&D financed by industry. In terms of entrepreneurship, more focused efforts to promote the number of SMEs innovating in-house and involved in collaborative R&D are needed. Under intellectual property, the main area needing attention is the limited number of patents and Community designs.

National Investments in R&I

Malta's current investment levels in Research and Innovation (R&I) as a percentage of GDP in both the public and the private sector are very minimal[51]. The low level for R&I activity in Maltese industry is a consequence of a number of factors. The dual nature of the Maltese economy is one structural factor – on the one hand there is a small number of high-tech FDIs that account for Malta's excellent performance on the application indicators for the European Innovation Scoreboard, and on the other hand one finds a prevalence of low-tech local manufacturing industry. At the same time, this predominance of low-tech manufacturers is mainly comprised of SMEs that have little or no in-house research capacity. R&D activity in the business sector is thus largely concentrated in 30-40 firms and is clustered around a number of specific sectors mainly related to high value added such as ICT and financial intermediation.

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50 Please note that the unabridged version is available on the EESC website (http://eesc.europa.eu/lisbon_strategy/index_en.asp).

51 0.18% and 0.44% respectively in 2004.

R&I activity in the public sector is concentrated around a number of research institutes and innovation centres, largely based at the University of Malta. R&I policy-related research activity is also undertaken by the Malta Council for Science and Technology (MCST), which advises Government on national R&I policies and strategies. Malta Information Technology and Training Services (MITTS) Ltd, a Public Sector company responsible for all government's IT hardware and software, including networks, is also engaged in related research and innovation activity.

National R&I Measures and Programmes

Undoubtedly the low percentage of GDP invested in R&I highlights the need for urgent action to divert resources to this important sector. A number of measures to encourage local research and innovation have been introduced by Malta Enterprise (the public corporation responsible for investment promotion) and MCST.

Malta Enterprise is currently operating 22 schemes to support FDIs and local enterprise, with 12 schemes extending to cover R&D and innovation, but only one scheme, the Research and Development Tax Credit, introduced in 2005, supports R&D activity exclusively.

MCST's National RTDI Programme launched in 2004, is open to local researchers and research entities, both public and private. The National RTDI Programme was designed to provide financial support for scientific research and development over the whole research and innovation chain, from basic and applied research to near-to-market innovations.

Participation in International Programmes

Malta's participation in international collaborative actions in the area of R&I ranges also from EU programmes, such as Life (the Financial Instrument for the Environment, introduced by the EU in 1992), FP6, Interreg and COST (one of the longest-running instruments supporting co-operation among scientists and researchers across Europe) and will shortly also extend to EUREKA (a pan-European network for market-oriented, industrial R&D).

Malta Enterprise is participating in two FP6 projects aimed at promoting the transfer of innovative technologies throughout Europe:

- The Innovation Relay Centre (IRC) Network; and
- The METTTES (More Efficient Transnational Technology Transfer in the Environmental Sector)

The IRC network is the world's largest technology network. The objective of the IRC office in Malta is to be Malta's window on European Innovation, helping companies and research organizations to transfer technologies to and from the rest of Europe. The METTTES project has resulted from the IRC network and aims at coming up with a more efficient methodology for innovative technology transfer specifically in the environmental sector.

National Strategy for Research and Innovation 2007-2010

The National Strategy for Research and Innovation 2007-2010 recommends actions to increase R&I spending in Government and public sector entities as well as the private sector. The formulation of an R&I strategy should also be introduced by certain government departments and public sector entities whereby an allocation of 0.25 per cent of their turnover or budget in R&I is primarily oriented towards improving efficiency and reducing cost of ownership. With respect to such entities and departments, MCST is to work with the University of Malta to introduce a programme for science and technology management.

Private sector incentives

MCST, Malta Enterprise and the Ministry for Competitiveness and Communications should also work together on an on-going basis so that Government introduces the right incentives at the right time in order to promulgate R&I in the private sector. This document states that the Government is to increase its investment in the setting up of the enabling R&I framework to 0.75 per cent of GDP by 2010.

With respect to the creation of attractive clusters, measures aimed at encouraging collaboration and the function of the innovation system include the Capacity Building component implemented under the first National programme for R&I. Malta Enterprise also operates Malta's first Business Incubation Centre.

EuroMediti Initiative

2006 also marked the endorsement by the Maltese Government of the Euro-Mediterranean Initiative for Technology and Innovation (EuroMedITI), and the allocation of seed funding for the initiative through MCST. It aims to address two main challenges to the dissemination of innovation in the Mediterranean:

- The serious obstacle to the creation of a properly functioning common market in the region presented by the diversity of customs, cultures, economic status and political realities, which is hampering the uptake of European technology in the developing states of the Mediterranean.
- The lack of basic understanding of market realities faced in particular by SMEs, which lack the necessary resources to access the region.

METIC Projection

May 2006 marked the launch of a new organisational measure funded under the Interreg III programme that will link universities with industries through the promotion and development of innovation centres and cross-border co-operation between Malta and Sicily.

Researcher Careers and Mobility

Proposals to ensure researcher mobility have been outlined in the R&I strategy. A science popularisation strategy over a period of twenty years has been outlined as a necessity in the R&I strategy, which will be spearheaded by the Ministry for Education, Youth and Employment (MEYE) and MCST.

Industry-Academia Links

With regard to the enhancement of the cooperation and technology transfer between public research and industry, the Malta Federation of Industry particularly as well as other employer constituted bodies should work with the University of Malta (UOM) to identify critical specialised SET management programmes at post-graduate level and provide financial support to the University in the delivery of such programmes.

National Reform Programme

Malta's 2005 National Reform Program (NRP) and the National Strategic Reference Framework (NSRF) for 2007-2013 both outline the importance of education in setting the "background conditions" for a more broad based innovation policy and in improving the country's competitiveness. Malta's NRP highlights a number of principles which must be taken into account in drawing up future R&I policy and programmes. A core principle relates to the need to establish a nexus between the knowledge institutions and business, which is currently still missing.

The Way Forward

A Roadmap

Strong efforts are required in the next phase of implementation planning to ensure that the appropriate coordination mechanisms are in place and to ensure timely investment in the human resources required to put these measures into effect. It entails continued efforts to define a national innovation policy per se and this requires the development of a clear rationale and comprehensive framework for integrating the various innovation policy measures being introduced. Cross-ministerial policy linkages as well as industry-academia links should be strengthened.

The National Minimum Curriculum

On a practical level, the National Minimum Curriculum needs to address the need for improved diffusion of risk taking and creativity skills for innovation in our educational system, which is still mostly based on memory or reproduction skills.

The Gender Dimension

There is the need to ensure that the gender dimension is given priority in particular in the areas of Science, IT and Technology. Attracting the female student population to specialise in these areas is important, as it is clear that strategies regarding the future of the Maltese economy are geared towards investing in these sectors. Female participation in these areas is still low.

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