

ANNEX C: EUROPEAN INNOVATION SCOREBOARD 2006 – DEFINITIONS AND INTERPRETATION

#	EIS 2006 indicators	Numerator	Denominator	Interpretation
1.1	New S&E graduates per 1000 population aged 20-29	Number of S&E (science and engineering) graduates. S&E graduates are defined as all post-secondary education graduates (ISCED classes 5a and above) in life sciences (ISC42), physical sciences (ISC44), mathematics and statistics (ISC46), computing (ISC48), engineering and engineering trades (ISC52), manufacturing and processing (ISC54) and architecture and building (ISC58).	The reference population is all age classes between 20 and 29 years inclusive.	The indicator is a measure of the supply of new graduates with training in Science & Engineering (S&E). Due to problems of comparability for educational qualifications across countries, this indicator uses broad educational categories. This means that it covers everything from graduates of one-year diploma programmes to PhDs. A broad coverage can also be an advantage, since graduates of one-year programmes are of value to incremental innovation in manufacturing and in the service sector.
1.2	Population with tertiary education per 100 population aged 25-64	Number of persons in age class with some form of post-secondary education (ISCED 5 and 6).	The reference population is all age classes between 25 and 64 years inclusive.	This is a general indicator of the supply of advanced skills. It is not limited to science and technical fields because the adoption of innovations in many areas, in particular in the service sectors, depends on a wide range of skills. Furthermore, it includes the entire working age population, because future economic growth could require drawing on the non-active fraction of the population. International comparisons of educational levels however are difficult due to large discrepancies in educational systems, access, and the level of attainment that is required to receive a tertiary degree. Differences among countries should be interpreted with caution.
1.3	Broadband penetration rate (number of broadband lines per 100 population)	Number of broadband lines. Broadband lines are defined as those with a capacity equal to or higher than 144 Kbit/s.	Total population as defined in the European System of Accounts (ESA 1995).	Realising Europe's full e-potential depends on creating the conditions for electronic commerce and the Internet to flourish, so that the Union can catch up with its competitors by hooking up many more businesses and homes to the Internet via fast connections. The Community and the Member States are to make available in all European countries low cost, high-speed interconnected networks for Internet access and foster the development of state-of-the-art information technology and other telecom networks as well as the content for those networks (Lisbon European Council, 2000). The Barcelona European Council (2002) attached priority to the widespread availability and use of broadband networks throughout the Union by 2005 and the development of Internet protocol IPv6. Further development in this area requires accelerated broadband deployment; in this respect the Brussels European Council (2003) called on Member States to put in place national broadband / high speed Internet strategies by end 2003 and aim for a substantial increase in high speed Internet connections by 2005.

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1.4	Participation in life-long learning per 100 population aged 25-64)	Number of persons involved in life-long learning. Life-long learning is defined as participation in any type of education or training course during the four weeks prior to the survey. Education includes both courses of relevance to the respondent's employment and general interest courses, such as in languages or arts. It includes initial education, further education, continuing or further training, training within the company, apprenticeship, on-the-job training, seminars, distance learning, and evening classes.	The reference population is all age classes between 25 and 64 years inclusive	A central characteristic of a knowledge economy is continual technical development and innovation. Individuals need to continually learn new ideas and skills or to participate in life-long learning. All types of learning are valuable, since it prepares people for "learning to learn". The ability to learn can then be applied to new tasks with social and economic benefits.
1.5	Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education)	Number of persons aged 20-24 having completed at least upper secondary education, i.e. with an education level ISCED 3-4 minimum.	The reference population is all age classes between 20 and 24 years inclusive	The indicator measures the qualification level of the population aged 20-24 years in terms of formal educational degrees. So far it provides a measure for the "supply" of human capital of that age group and for the output of education systems in terms of graduates. A study for OECD countries suggests a positive link between education and economic growth. According to this study an additional year of average school attainment is estimated to increase economic growth by around 5% immediately and by further 2.5% in the long run (De la Fuente and Ciccone, "Human capital in a global and knowledge-based economy", Final report for DG Employment and Social Affairs, 2002). Completed upper secondary education is generally considered to be the minimum level required for successful participation in a knowledge-based society. It is increasingly important not just for successful entry into the labour market, but also to allow students access to learning and training opportunities offered by higher education. School attainment is a primary determinant of individual income and labour market status. Persons who have completed at least upper secondary education have access to jobs with higher salaries and better working conditions. They also have a markedly higher employment rate than persons with at most lower secondary education (Employment in Europe 2004).

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2.1	Public R&D expenditures (% of GDP)	Difference between GERD (Gross domestic expenditure on R&D) and BERD (Business enterprise expenditure on R&D). Both GERD and BERD according to the Frascati-manual definitions, in national currency and current prices.	Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices.	R&D expenditure represents one of the major drivers of economic growth in a knowledge-based economy. As such, trends in the R&D expenditure indicator provide key indications of the future competitiveness and wealth of the EU. Research and development spending is essential for making the transition to a knowledge-based economy as well as for improving production technologies and stimulating growth. Recognising the benefits of R&D for growth and being aware of the rapidly widening gap between Europe's R&D effort and that of the principal partners of the EU in the world, the Barcelona European Council (March 2003) set the EU a target of increasing R&D expenditure to 3 per cent of GDP by 2010, two thirds of which should come from the business enterprise sector.
2.2	Business R&D expenditures (% of GDP)	All R&D expenditures in the business sector (BERD), according to the Frascati-manual definitions, in national currency and current prices.	Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices.	The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sector (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories.
2.3	Share of medium-high-tech and high-tech R&D (% of manufacturing R&D expenditures)	R&D expenditures in medium-high and high-tech manufacturing, in national currency and current prices. These include chemicals (NACE24), machinery (NACE29), office equipment (NACE30), electrical equipment (NACE31), telecommunications and related equipment (NACE32), precision instruments (NACE33), automobiles (NACE34) and aerospace and other transport (NACE35).	R&D expenditures in total manufacturing, in national currency and current prices.	This indicator captures whether a country invests in future technologies (medium-high and high-tech manufacturing industries) or rather in historical industries (medium-low and low-tech manufacturing industries). This follows a recent report published by the JRC (R&D expenditure scoreboard), which highlights that the R&D problem observed in Europe is more a business structure problem. In most sectors R&D intensity is as high in the EU as in the rest of the world, however the relative importance of R&D intensive sectors in the total business is relatively low in Europe.
2.4	Share of enterprises receiving public funding for innovation	Number of innovative enterprises that have received public funding. Public funding includes financial support in terms of grants and loans, including a subsidy element, and loan guarantees. Ordinary payments for orders of public customers are not included. (<i>Community Innovation Survey</i>)	Total number of enterprises, thus both innovating and non-innovating enterprises. (<i>Community Innovation Survey</i>)	This indicator measures the degree of government support to innovation. The indicator gives the percentage of all firms (innovators and non-innovators combined) that received any public financial support for innovation from at least one of three levels of government (local, national and the European Union).
3.1	SMEs innovating in-house (% of SMEs)	Sum of SMEs with in-house innovation activities. Innovative firms are defined as those who introduced new products or processes either 1) in-house or 2) in combination with other firms. This indicator does not include new products or processes developed by other firms. (<i>Community Innovation Survey</i>)	Total number of SMEs. (<i>Community Innovation Survey</i>)	This indicator measures the degree to which SMEs, that have introduced any new or significantly improved products or production processes during the period 1998-2000, have innovated in-house. The indicator is limited to SMEs because almost all large firms innovate and because countries with an industrial structure weighted to larger firms would tend to do better.

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3.2	Innovative SMEs co-operating with others (% of SMEs)	Sum of SMEs with innovation co-operation activities. Firms with co-operation activities are those that had any co-operation agreements on innovation activities with other enterprises or institutions in the three years of the survey period. (<i>Community Innovation Survey</i>)	Total number of SMEs. (<i>Community Innovation Survey</i>)	This indicator measures the degree to which SMEs are involved in innovation co-operation. Complex innovations, in particular in ICT, often depend on the ability to draw on diverse sources of information and knowledge, or to collaborate on the development of an innovation. This indicator measures the flow of knowledge between public research institutions and firms and between firms and other firms. The indicator is limited to SMEs because almost all large firms are involved in innovation co-operation.
3.3	Innovation expenditures (% of turnover)	Sum of total innovation expenditure for enterprises, in national currency and current prices. Innovation expenditures includes the full range of innovation activities: in-house R&D, extramural R&D, machinery and equipment linked to product and process innovation, spending to acquire patents and licenses, industrial design, training, and the marketing of innovations. (<i>Community Innovation Survey</i>)	Total turnover for all enterprises, in national currency and current prices. (<i>Community Innovation Survey</i>)	This indicator measures total innovation expenditure as percentage of total turnover. Several of the components of innovation expenditure, such as investment in equipment and machinery and the acquisition of patents and licenses, measure the diffusion of new production technology and ideas. Overall, the indicator measures total expenditures on many activities of relevance to innovation. The indicator partly overlaps with the indicator on business R&D expenditures.
3.4	Early-stage venture capital (% of GDP)	Venture capital investment is defined as private equity raised for investment in companies. Management buyouts, management buyins, and venture purchase of quoted shares are excluded. Early-stage capital includes seed and start-up capital. <i>Seed</i> is defined as financing provided to research, assess and develop an initial concept before a business has reached the start-up phase. <i>Start-up</i> is defined as financing provided for product development and initial marketing, manufacturing, and sales. Companies may be in the process of being set up or may have been in business for a short time, but have not yet sold their product commercially.	Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices.	The amount of early-stage venture capital is a proxy for the relative dynamism of new business creation. In particular, for enterprises using or developing new (risky) technologies venture capital is often the only available means of financing their (expanding) business. <i>Note: in order to reduce volatility, the indicator is based on a two-year average.</i>

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3.5	ICT expenditures (% of GDP)	Total expenditures on information and communication technology (ICT), in national currency and current prices. ICT includes office machines, data processing equipment, data communication equipment, and telecommunications equipment, plus related software and telecom services.	Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices.	ICT is a fundamental feature of knowledge-based economies and the driver of current and future productivity improvements. An indicator of ICT investment is crucial for capturing innovation in knowledge-based economies, particularly due to the diffusion of new IT equipment, services and software. One disadvantage of this indicator is that it is ultimately obtained from private sources, with a lack of good information on the reliability of the data. Another disadvantage is that part of the expenditures is for final consumption and may have few productivity or innovation benefits.
3.6	SMEs who introduced an organizational innovation (% of SMEs)	Number of SMEs who have either introduced "new or significantly improved knowledge management systems", "a major change to the organisation of work within their enterprise" or "new or significant changes in their relations with other firms or public institutions". A 'Yes' response to at least one of these categories would identify a SME as having introduced an organisational innovation.. (<i>Community Innovation Survey</i>)	Total number of SMEs. (<i>Community Innovation Survey</i>)	The Community Innovation Survey mainly asks firms about their technical innovation, Many firms, in particular in the services sectors, innovate through other non-technical forms of innovation. Examples of these are organisational innovations. This indicator tries to capture the extent that SMEs innovate through non-technical innovation.
4.1	Employment in high-tech services (% of total workforce)	Number of employed persons in the high-tech services sectors. These include post and telecommunications (NACE64), information technology including software development (NACE72) and R&D services (NACE73).	The total workforce includes all manufacturing and service sectors.	The high technology services provide services directly to consumers, such as telecommunications, and provide inputs to the innovative activities of other firms in all sectors of the economy. The latter can increase productivity throughout the economy and support the diffusion of a range of innovations, in particular those based on ICT.
4.2	Exports of high technology products as a share of total exports	Value of high-tech exports, in national currency and current prices. High-tech exports include exports of the following products: aerospace; computers and office machinery; electronics-telecommunications; pharmaceuticals; scientific instruments; electrical machinery; chemistry; non-electrical machinery and armament (cf. OECD STI Working Paper 1997/2 for the SITC Revision 3 codes).	Value of total exports, in national currency and current prices.	The indicator measures the technological competitiveness of the EU i.e. the ability to commercialise the results of research and development (R&D) and innovation in the international markets. It also reflects product specialisation by country. Creating, exploiting and commercialising new technologies is vital for the competitiveness of a country in the modern economy. This is because high technology sectors are key drivers for economic growth, productivity and welfare, and are generally a source of high value added and well-paid employment. The Brussels European Council (2003) stressed the role of public-private partnerships in the research area as a key factor in developing new technologies and enabling the European high-tech industry to compete at the global level.

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4.3	Sales of new-to-market products (% of turnover)	Sum of total turnover of new or significantly improved products for all enterprises. (<i>Community Innovation Survey</i>)	Total turnover for all enterprises, in national currency and current prices. (<i>Community Innovation Survey</i>)	This indicator measures the turnover of new or significantly improved products, which are also new to the market, as a percentage of total turnover. The product must be new to the firm, which in many cases will also include innovations that are world-firsts. The main disadvantage is that there is some ambiguity in what constitutes a 'new to market' innovation. Smaller firms or firms from less developed countries could be more likely to include innovations that have already been introduced onto the market elsewhere.
4.4	Sales of new-to-firm products (% of turnover)	Sum of total turnover of new or significantly improved products to the firm but not to the market for all enterprises. (<i>Community Innovation Survey</i>)	Total turnover for all enterprises, in national currency and current prices. (<i>Community Innovation Survey</i>)	This indicator measures the turnover of new or significantly improved products to the firm as a percentage of total turnover. These products are not new to the market. Sales of new to the firm but not new to the market products are a proxy of the use or implementation of elsewhere already introduced products (or technologies). This indicator is thus a proxy for the degree of diffusion of state-of-the-art technologies.
4.5	Employment in medium-high and high-tech manufacturing (% of total workforce)	Number of employed persons in the medium-high and high-tech manufacturing sectors. These include chemicals (NACE24), machinery (NACE29), office equipment (NACE30), electrical equipment (NACE31), telecommunications and related equipment (NACE32), precision instruments (NACE33), automobiles (NACE34) and aerospace and other transport (NACE35).	The total workforce includes all manufacturing and service sectors.	The share of employment in medium-high and high technology manufacturing sectors is an indicator of the manufacturing economy that is based on continual innovation through creative, inventive activity. The use of total employment gives a better indicator than using the share of manufacturing employment alone, since the latter will be affected by the hollowing out of manufacturing in some countries.
5.1	EPO patents per million population	Number of patents applied for at the European Patent Office (EPO), by year of filing. The national distribution of the patent applications is assigned according to the address of the inventor.	Total population as defined in the European System of Accounts (ESA 1995).	The capacity of firms to develop new products will determine their competitive advantage. One indicator of the rate of new product innovation is the number of patents. This indicator measures the number of patent applications at the European Patent Office.
5.2	USPTO patents per million population	Number of patents granted by the US Patent and Trademark Office (USPTO), by year of grant. Patents are allocated to the country of the inventor, using fractional counting in the case of multiple inventor countries.	Total population as defined in the European System of Accounts (ESA 1995).	The capacity of firms to develop new products will determine their competitive advantage. One indicator of the rate of new product innovation is the number of patents. This indicator measures the number of patents granted by the US Patent and Trademark Office.

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5.3	Triadic patent families per million population	Number of triad patents. A patent is a triad patent if, and only if, it is filed at the European Patent Office (EPO), the Japanese Patent Office (JPO) and is granted by the US Patent & Trademark Office (USPTO).	Total population as defined in the European System of Accounts (ESA 1995).	The disadvantage of both the EPO and USPTO patent indicator is that European countries and the US respectively have a 'home advantage' as patent rights differ among countries. A patent family is a group of patent filings that claim the priority of a single filing, including the original priority filing itself, and any subsequent filings made throughout the world. Trilateral patent families are a filtered subset of patent families for which there is evidence of patenting activity in all trilateral blocks (USPTO, EPO, JPO). No country will thus have a clear 'home advantage'.
5.4	Number of new community trademarks per million population	Number of new community trademarks. A trademark is a distinctive sign, which identifies certain goods or services as those produced or provided by a specific person or enterprise. The Community trademark offers the advantage of uniform protection in all countries of the European Union on the strength of a single registration procedure with the Office for Harmonization.	Total population as defined in the European System of Accounts (ESA 1995).	The Community trade mark gives its proprietor a uniform right applicable in all Member States of the European Union on the strength of a single procedure which simplifies trade mark policies at European level. It fulfils the three essential functions of a trade mark at European level: it identifies the origin of goods and services, guarantees consistent quality through evidence of the company's commitment vis-à-vis the consumer, and is a form of communication, a basis for publicity and advertising. The Community trade mark may be used as a manufacturer's mark, a mark for goods of a trading company, or service mark. It may also take the form of a collective trade mark: properly applied, the regulation governing the use of the collective trade mark guarantees the origin, the nature and the quality of goods and services by making them distinguishable, which is beneficial to members of the association or body owning the trade mark. <i>Note: in order to reduce volatility, the indicator is based on a two-year average.</i>
5.5	Number of new community designs per million population	Number of new community designs. A registered Community design is an exclusive right for the outward appearance of a product or part of it, resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation.	Total population as defined in the European System of Accounts (ESA 1995).	A design is the outward appearance of a product or part of it resulting from the lines, contours, colours, shape, texture, materials and/or its ornamentation. A product can be any industrial or handicraft item including packaging, graphic symbols and typographic typefaces but excluding computer programs. It also includes products that are composed of multiple components, which may be disassembled and reassembled. Community design protection is directly enforceable in each Member State and it provides both the option of an unregistered and a registered Community design right for one area encompassing all Member States. <i>Note: in order to reduce volatility, the indicator is based on a two-year average.</i>