Human Resources in Science and Technology in the Baltic Sea Region

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Abstract

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1. Introduction

Data on Human Resources in Science and Technology (HRST) contribute significantly to the measuring of the new knowledge based networked economy. This article deals with measures taken to promote science and technology as the aim of European community.

Technology innovation contributes nearly half of the nation's productivity and economic growth. Innovation is a complex and multidimensional activity, that cannot be measured directly or with a single indicator. European Innovation Scoreboard 2005 divides measures into 5 categories: innovation drivers, knowledge protection, innovation and entrepreneurship, application and intellectual property. All measures from the long list were assigned to certain category. European Innovation Scoreboard 2004 counted directly 5 indicators only in Human Resources in Science and Technology. In 2003 *White Paper on Science and Technology* of Ministry of Education, Culture, Sports, Science and Technology of Japanese Government takes the theme of "Human Resources in Science and Technology Needed by Japan in the Future", based on the recognition that people who create and utilize knowledge are the foundation for a science and technology nation. This discussion is related to the need for Japan to build up a society with dangerous effects of the aging population and the trend toward fewer children.

From both experience – European and Japanese – were taken the ideas to measure the human resources for knowledge-based society and give the recommendations to monitoring of innovation processes and resources in the regions. The recommendations apply people engaged in science and technology, and of their activities environment, rewards researchers and technicians and to the development of advanced professional education.

2. Innovation measurement

Modern societies like Finland, Japan, USA, Switzerland, Sweden, Denmark, Germany are creating new knowledge centring on science and technology and making that knowledge applicable in society. The increase of value added based on knowledge is the key to economic development.

Metrics definitions and innovation models need to be harmonized or at least made comparable internationally for benchmarking. The European or OECD's survey's give the convergent ratings of countries. These methodologies evaluate to the appraisement through the indicators transformed to the aggregated indexes. Proposed regional systems of innovation metrics should respect the business sector targets, variable definitions, data collection methods, analysis procedures and dissemination techniques. The evolution of the benchmarking-indicators was shown in the table 1.

Table 1: Evolution of Innovation Metrics by Generation

1st Generation	2nd Generation	3rd Generation	4th Generation
• R&D expenditures • S&T Personnel • Capital • Tech intensity	• Patents • Publications • Products • Quality Change	• Innovation surveys • Indexing • Benchmarking innovation capacity	• Knowledge • Intangibles • Networks • Demand • Clusters • Management techniques • Risk/Return • System Dynamics
(1950s-60s) Input Indicators; linear conception of innovation	(1970s-80s) Output indicators; input indicators by accounting for the intermediate outputs of S&T activities	(1990s) Innovation Indicators; set of innovation indicators and indexes	(2000 + emerging focus) Process Indicators

Source: Egils Milberg Nicholas Vonortas, Innovation Metrics, Measurement to Insight. White Paper prepared for National Innovation Initiative 21st Century Innovation Working Group, IBM Corporation. www.innovationecosystems.com.

The latest generations are focused on a surveys and integration of publicly available data. The main target of the measurement of innovation capacities is on benchmarking and ranking the nations. A main difficulty is the validity of international data comparisons, especially these from representative method. A next difficulty is the incorporating service sector innovations into the surveys. But there is more difficulties in the level of regional development. The measure of innovation processes and capacities should be identify for the monitoring of regional innovation strategies.

European Innovation Scoreboard divides measures into 5 categories: innovation drivers, knowledge protection, innovation and entrepreneurship, application and intellectual property. All measures from the long list were assigned to certain category. The nation's classification of EIS 2005 was presented in the table 2.

Table 2. European Innovation index scores and rankings (innovation input and innovation output) with three alternative weighting methods

Country ranking (2005)	Budget allocation (average weights)				Equal weights				Factor Analysis			
	input		output		input		output		input		output	
1	**FI**	1.19	**FI**	1.56	**FI**	1.15	**FI**	1.29	**FI**	1.16	**FI**	1.40
2	**SE**	1.09	**SE**	1.20	**SE**	1.01	**CH**	1.17	**SE**	1.07	**SE**	1.13
3	**JP**	0.74	**CH**	1.19	**JP**	0.71	**SE**	1.16	**JP**	0.68	**CH**	1.10
4	**US**	0.67	**DE**	1.10	**US**	0.68	**DE**	1.12	**US**	0.64	**DE**	0.98
5	**CH**	0.66	**JP**	0.83	**BE**	0.54	**JP**	0.84	**BE**	0.59	**JP**	0.89
6	**IS**	0.52	**DK**	0.70	**CH**	0.52	**DK**	0.76	**CH**	0.54	**US**	0.77
7	**DE**	0.51	**US**	0.69	**DE**	0.45	**US**	0.73	**DK**	0.49	**DK**	0.65
8	**BE**	0.49	**IT**	0.45	**DK**	0.40	**LU**	0.56	**IS**	0.44	**FR**	0.35
9	**DK**	0.37	**AT**	0.33	**IS**	0.37	**NL**	0.44	**DE**	0.43	**LU**	0.32
10	**UK**	0.34	**LU**	0.28	**UK**	0.35	**AT**	0.41	**NL**	0.35	**IT**	0.30

11	**FR**	0.29	**NL**	0.27	**NL**	0.34	**FR**	0.32	**NO**	0.32	**AT**	0.29
12	**NL**	0.27	**FR**	0.27	**FR**	0.22	**UK**	0.27	**UK**	0.31	**NL**	0.29
13	**NO**	0.17	**BE**	0.23	**NO**	0.22	**BE**	0.26	**AT**	0.16	**IE**	0.28
14	**AT**	0.13	**ES**	0.11	**AT**	0.18	**IT**	0.26	**FR**	0.13	**UK**	0.25
15	**EE**	-0.06	**IE**	0.10	**EE**	0.01	**IE**	0.22	**EE**	0.04	**BE**	0.21
16	**SI**	-0.08	**UK**	0.04	**SI**	-0.05	**MT**	-0.06	**SI**	0.01	**MT**	0.15
17	**IE**	-0.24	**PT**	-0.02	**IE**	-0.18	**ES**	-0.08	**LU**	-0.13	**ES**	0.00
18	**LU**	-0.26	**CZ**	-0.14	**LU**	-0.24	**CZ**	-0.23	**IE**	-0.22	**CZ**	-0.12
19	**LT**	-0.28	**MT**	-0.23	**LT**	-0.27	**NO**	-0.30	**CY**	-0.28	**PT**	-0.20
20	**PT**	-0.29	**SI**	-0.32	**ES**	-0.28	**SI**	-0.36	**LT**	-0.30	**SI**	-0.37
21	**IT**	-0.30	**SK**	-0.35	**IT**	-0.29	**PT**	-0.39	**ES**	-0.31	**NO**	-0.39
22	**SK**	-0.30	**NO**	-0.43	**HU**	-0.34	**HU**	-0.41	**IT**	-0.37	**HU**	-0.40
23	**ES**	-0.34	**RO**	-0.53	**CY**	-0.34	**IS**	-0.48	**TR**	-0.38	**SK**	-0.43
24	**HU**	-0.35	**HU**	-0.59	**PT**	-0.36	**SK**	-0.48	**HU**	-0.41	**IS**	-0.56
25	**PL**	-0.42	**PL**	-0.60	**PL**	-0.38	**PL**	-0.65	**EL**	-0.43	**PL**	-0.64
26	**CZ**	-0.44	**TR**	-0.64	**BG**	-0.44	**TR**	-0.70	**PL**	-0.44	**EE**	-0.66
27	**CY**	-0.46	**EE**	-0.66	**CZ**	-0.45	**EE**	-0.71	**PT**	-0.47	**TR**	-0.68
28	**BG**	-0.53	**IS**	-0.68	**TR**	-0.47	**RO**	-0.76	**CZ**	-0.51	**RO**	-0.71
29	**TR**	-0.53	**LT**	-0.68	**EL**	-0.52	**LT**	-0.78	**BG**	-0.52	**LT**	-0.75
30	**EL**	-0.54	**LV**	-0.76	**RO**	-0.56	**BG**	-0.82	**RO**	-0.53	**LV**	-0.79
31	**LV**	-0.62	**EL**	-0.82	**SK**	-0.58	**LV**	-0.83	**SK**	-0.59	**EL**	-0.82
32	**RO**	-0.66	**BG**	-0.87	**LV**	-0.63	**EL**	-0.84	**LV**	-0.63	**BG**	-0.84
33	**MT**	-0.76	**CY**	-1.01	**MT**	-0.78	**CY**	-0.93	**MT**	-0.84	**CY**	-1.00

Source: *Methodology Report on European Innovation Scoreboard 2005*, Annex VI, European Commission, Enterprise Directorate-General 2005.

These 4th generation indicators of the knowledge based networked economy can be improved only through a coordinated and internationally visible effort. The next difficulties in the innovation's examining is the international and regional character of the processes. We cannot confine metrics to any one country, but the most values was taken into account, are accessible on the nation's level. Many innovative companies have acquired global logic, many regions monitor the processes with the date prepared as representative only for the whole country - the national indicators only misrepresent all problems.

3. Human resources in innovation measurement

In a knowledge-based society, it is the people who create and utilize knowledge that constitute the foundation of all activities, including the 'production' of knowledge. The statistical data show in each country, that the percentage of all persons engaged in professional, technical and related occupations[1] increased throughout the 1990s. The expansion of globalization has brought in recent years with it frequent recruiting of professional, technical and related personnel, including researchers and technicians, across international boarders. In perspective of a future trend toward an aged society with fewer children, it is not easy to continue in-creasing personnel engaged in science and technology.

There are many people besides researchers who are engaged in science and technology-related activities:

- researchers,
- personnel supporting researcher (technicians and research assinstants),
- personnel who manage science and technology activities (MOT[2] personnel and personnel engaged in evaluation),
- personnel who utilize the fruits of science and technology in economic activities and in society, particularly those who can mediate and serve as go-betweens in joint research, and those who possess specialist knowledge in

[1] Consistent with the International Standard Classification of Occupations.
[2] Management of Technology.

science and technology and are also well versed in legal affairs (engineers and personnel administering research affairs)

– personnel who serve as bridges between science and technology and the public at large (personnel supporting business startup, personal related to intellectual property[3], personnel engaged in appraisal, *interpreters*).

It is particularly difficult to draw a clear line between the two in business R&D, where technicians who were conducting research frequently transfer along with their research results to the development and production sides. Consequently, it should be noted that some of the personnel in this report who are called researchers are included within those referred to as technicians. The main activities of professional, technical and related occupations was presented on figure 1. From the Survey of the State of Japan's Research Activities (FY 2002) we can conclude, that the two last mentioned group are insufficient. In this survey the degree of insufficiency in qualitative and quantitative terms was examined as researchers' feelings about the shortage of various HRST. Personnel intermediating between science and technology and society proved insufficient both quantitatively and qualitatively, management personnel only qualitatively. In Poland, for example, this problem is similar, but this personnel is not insufficient in 70 % like Japan, but is nearly missing in 90 %.

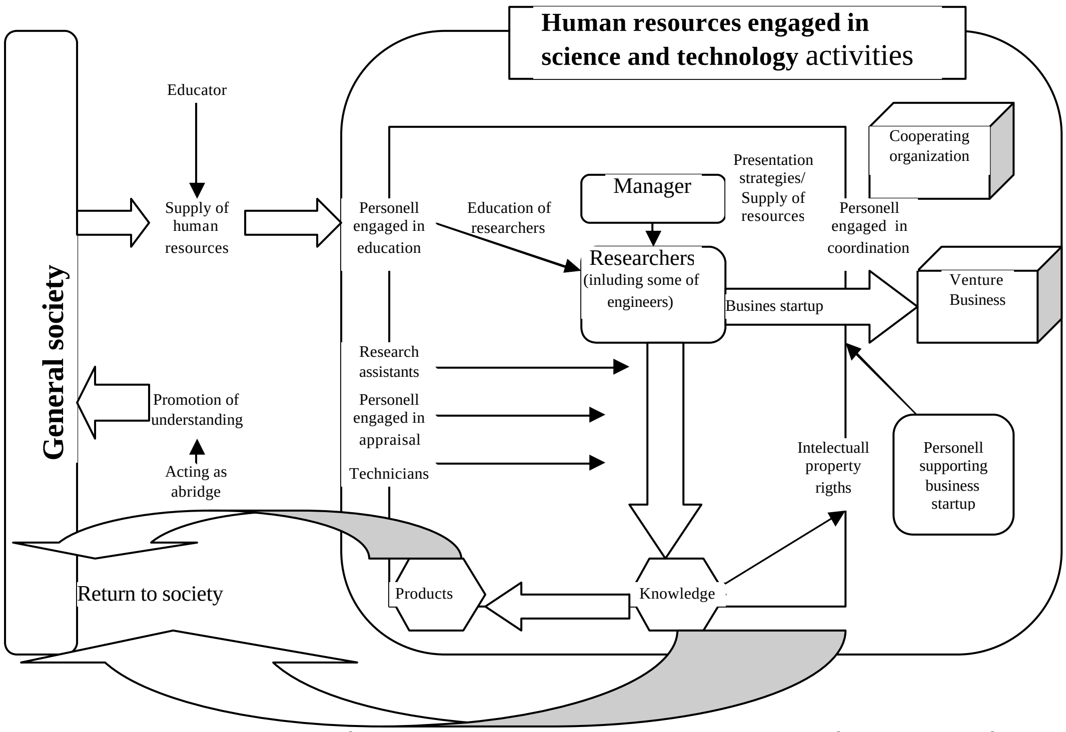

Fig. 1. Concept diagram of human resources related to since and technology from Ministry of Education, Culture, Sports, Science and Technology Japanese Government

Source: *White Paper On Science And Technology 2003. Human Resource in Science and Technology Required of Japan in the Future*. MEXT, www.mext.go.jp.

[3] It is required to carry out: intensification of education in the field of business related laws, including intellectual property law, at Law Schools; supply of technology-related personnel with a deep knowledge of business; and development of expert personnel, such as patent attorneys, and intensification of their functions.

The aim of Eurostat's research is to examine three distinct parts of Human Resources in Scince and Technology, in detail: education inflows[4], stocks of HRST and job-to-job mobility of employed HRST. HRST are defined by Eurostat as persons fulfilling at least one of the following conditions:

a) Human resources in terms of education (HRSTE): Individuals having successfully completed tertiary level education in a S&T[5] field of study,
and/or
b) Human resources in terms of occupation (HRSTO): Individuals working in a S&T occupation as professionals and technicians.

Eurostat's data come from two main sources:

- Eurostat's education database, collected *via* the joint UNESCO/OECD/Eurostat questionnaire on education statistics. This data are collected through the compilation from national administrative sources, reported by Ministries of Education or National Statistical Offices. In most countries the national data collections on enrolments, graduates, personnel etc are census surveys or, in some cases, extractions from administrative registers.
- The European Union Labour Force Survey – EU LFS - is used for elaborating data on stocks of HRST and job-to-job mobility data. This data come from a quarterly large sample survey covering the population in private households (rates range 0,2 – 3,3 %).

European Innovation Scoreboard 2004 Indicators listed the measures of human resources as follow:

1.1. S&E (science and engineering) graduates – the indicator is defined as all post-secondary education graduates (ISCED classes 5a and above) in life sciences, physical sciences, mathematics and statistics, computing, engineering and engineering trades, manufacturing and processing and architecture and building as share of 20 - 29 years age class.

1.2. Population with tertiary education (% of 25 - 64 years age class) - number of persons in age class with some form of post-secondary education (ISCED 5 and 6) as the part of reference population.

1.3. Participation in life-long learning (% of 25 - 64 age class) 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 as a quote of reference population.

1.4. Employment in medium-high and high-tech manufacturing – number of employed persons in the medium-high and high-technology manufacturing sectors as a percentage of total workforce. These include chemicals, machinery, office

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[4] Consistent with:

- *The International Standard Classification of Education* (ISCED 97), giving the level of formal education achievement
- The International Standard Classification of Occupation (ISCO-88 COM), detailing the type of occupation.

[5] There are the seven broad S&T fields of study are used: Natural Sciences, Engineering and Technology, Medical Sciences, Agricultural sciences, Social sciences, Humanities and Other fields (see *Canberra Manual*).

equipment, electrical equipment, telecommunications and related equipment, precision instruments, automobiles and aerospace and other transport.

1.5. Employment in high-tech services – number of employed persons in the high-technology services sectors. These include post and telecommunications, information technology including software development and R&D services as a percentage of total workforce. The estimation based on LFS from national researches.

In the EIS 2005 the human resources are measured as Innovation drivers (input 1.1 – 1.3. EIS 2004 and one new indicator[6]) and Application (output 1.4, 1.5 EIS 2004). The input and output indicator, both aggregate, may include composite knowledge investment indicators and composite performance values. The additionally indicators EXIS (Exploratory Approach to Innovation Scoreboards) are concentrated on firm level.

The EIS' and EXIS' ideas don't suffice the regional needs, like the examples from Canada[7], New Zeeland[8], Spain[9] or Poland (West Pomerania Region). To tackle the issue of employment and economic performance, the West Pomerania Regional Development Agency in Szczecin implemented a RIS (Regional Innovation Strategy) project with co-funding from the EU's Framework Programme for Research and Development. Before selecting the final list (short list) of measures to be used in the regional monitoring system, experts verified if the measures already selected cover all issues related to innovation. They used three different ways of verification:

a) on the basis of measures' groups used in the European Innovation Scoreboard;
b) on the basis of objectives and actions of the Regional Innovation Strategy in the West Pomeranian Region;
c) on the basis of the subject of the MORIS project (Regional monitoring system of the innovation resources and processes).

While working on the list it appeared that one the most important issues in our region is business support, both financial and non-financial; but none of the EIS category covered the topic. It was then decided to create more categories (variables) and to monitor following values[10]:

As Innovation drivers:

- Employment in R&D units (Science and Technology)
- Number of academic teachers (professors, associate and assistant professors)
- Number of higher education institutions' graduates and students (broken down by MSc, PhD, bachelor, type of school)
- Number of PhD thesis on new technologies and innovation
- Number of school hours on entrepreneurship and innovation (universities, high schools)
- Number of life-long learners
- Number of employees gaining knowledge on scholarships, abroad etc.
- Number of trainings for personnel and non-personnel on innovative technology/processes (by type, field etc.)
- Labour market requirements (professionals needed)

As Knowledge protection

[6] Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education).

[7] *Innovation Analysis Bulletin*, Vol. 3, Nr. 3, 2001. A tri-annual report from Statistics Canada.

[8] http://www.med.govt.nz.

[9] *Regional Innovation Indicators*, The Madrid Experience, Metropolis Thematic Group, 2003.

[10] S. Depa, J. Piekutowski, Z. Pluta (2006): *Final report of the monitoring group within the INTRO project*. ZARR, Szczecin.

– Number of researchers in R&D units in region
As Application
– Unemployment rate in graduates broken down by technical high schools and all types of universities)
– Labour market requirements (professionals needed)

At this moment the list of variables evaluated in some aggregated indicators, but the system is still preparing in MORIS project. The main objective of the project "Regional System of Monitoring of Innovation Processes and Resources" (MORIS) is to create and implement a system of collecting and analysing data on innovation resources and processes in the West Pomeranian Region. The need for monitoring innovation resources and processes was identified during West Pomeranian RIS project. All actors involved in the process agreed on creating a monitoring system of enterprises (SMEs and large companies), R&D sector and support instruments for innovation (financial and non-financial). Monitoring is mentioned in all strategic objectives of regional innovation strategy.

3. Pro-innovative human resources in the Baltic Sea Region

Human resources in science and technology in terms of occupation (HRSTO) are measured as a share of the economically active population in the age group 25-64. Human resources in science and technology in terms of education (HRSTE) are measured as percent of responding age groups of population. The often criticized values like Phd's number or personnel in Hi-tech or KIS, presented on figures 2-3, give similar classification of Baltic nations like EIS 2005. The analysis was done for countries with comparable data – Baltic Sea countries in EU, the data was taken from Eurostat. Fig. 2 shows students participating in second stage of tertiary education of study, as a percentage of the population 20-29 year old. This includes the total number of students, which leads to an advanced research qualification (ISCED level 6), in the educational fields Science, Mathematics and Computing and Engineering, Manufacturing and Construction. The levels and fields of education and training used follow the 1997 version of the International Standard Classification of Education (ISCED97) and the Eurostat Manual of fields of education and training (1999). The interesting phenomena is the percentage of Phd's in Mathematics, Computing, Engineering, Manufacturing and Construction in all Phd's. The excellent example is Denmark (67 %) – high classified in EIS rating. But the missing data for Finnland and incredible data for Norway give no possibility to verify such hypothesis.

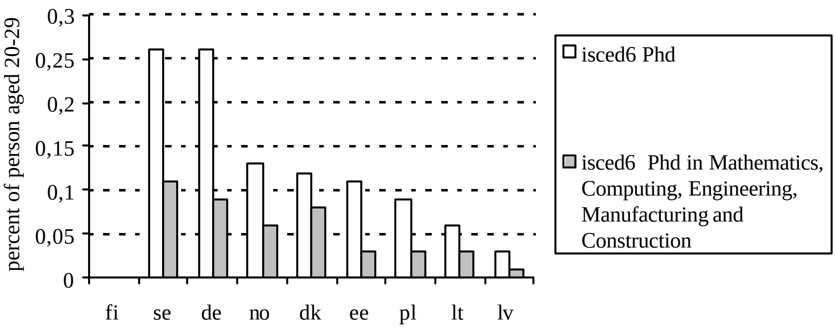

Fig. 2. Share of students participating in second stage of tertiary education of study of the population 20-29 year old in the Baltic Sea countries (EU) in 2004
Source: own elaboration for Eurostat's data.

Fig. 3 shows the employment in knowledge-intensive service sectors and in high- and medium-high technology manufacturing sectors as a share of total employment. Data source is the Community labour force survey (CLFS). The definition of knowledge-intensive services including high-technology services used by Eurostat is based on a selection of relevant items of NACE. The definition of high- and medium-high technology manufacturing sectors is based on the OECD definition.

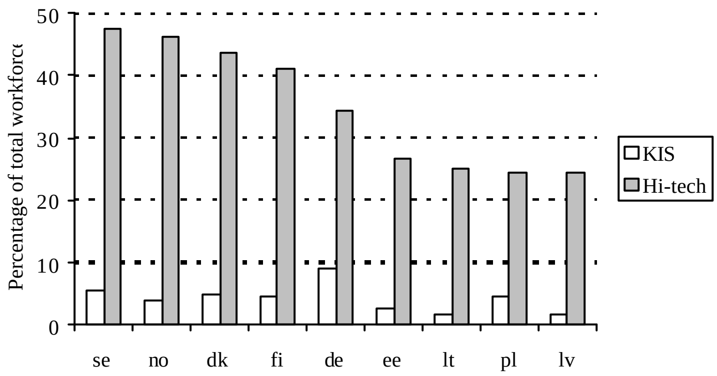

Fig. 3. Share of employment in KIS and Hi-tech manufacturing sector in the Baltic Sea countries (EU) in 2006
Source: own elaboration for Eurostat's data.

In general, unemployment rates in 2006 for HRST were much lower than for non HRST. In the EU, the HRST unemployment rates reached only 3%, while the rate of unemployment for non HRST climbed to 10%. The worst situation is in Poland, where the total unemployment rate shape on the level 3.8 % and for the young people (25-34 years old) – 5.3 % in 2006.

The highest European concentration of Human resources in S&T in terms of occupation (HRSTO) as a share of the labour force is found in capital regions, in regions in central Europe and in the Nordic countries. In absolute terms, Germany had the highest number of business enterprise sector (BES) researchers in Europe, with 161 980 persons (data for 2003). The proportion of these researchers working in the manufacturing sector reached 88 % in Germany and 76 % in Sweden. Nevertheless, some of the Baltic countries were an exception to this trend and had a larger proportion of researchers in the BES working in the services sector than in manufacturing: Estonia, Latvia (67 %). The highest proportion of BES researchers working in services is registered in Latvia with 67 %, followed by Estonia (58 %) and Norway with 52 %. The majority of researchers were employed in the BES (total for Europe). In the EU-25, their proportion was even higher in 2004 than for the total R&D personnel in FTE, as it reached 49 %. For example, 62% of Danish researchers worked in the BES. The worse situation is in the post-communist countries (see fig.4).

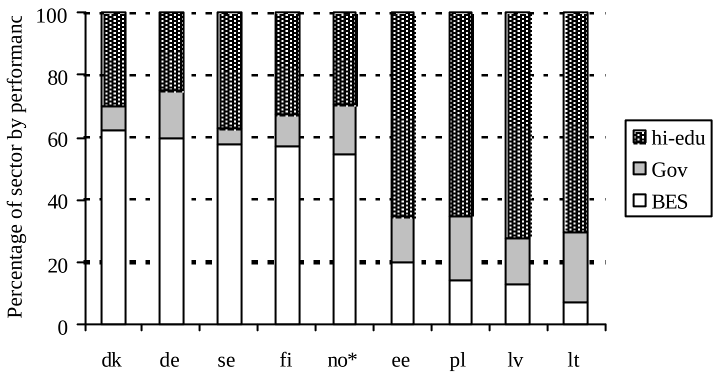

Fig. 4. Share of researchers in full-time equivalent, by sector of performance in the Baltic Sea countries (EU) in 2004 (*Norway's data available for 2003)
Source: own elaboration for Eurostat's data.

R&D personnel include all persons employed directly on R&D, plus persons supplying direct services to R&D. The researchers are measured in full-time equivalent (FTE). Among the countries the top countries in the ranking are Iceland leads, with 3.48%, ahead of Finland (3.11%), Sweden (2.49%), Denmark (2.29%) and Norway (2.26%). This are the leaders-countries in Europe not only in the Baltic Sea region. Six EU-25 countries have less than 1% of their employed persons working in R&D, as against four countries in 2000.

The indicator "Tertiary graduates in science and technology" includes new tertiary graduates in a calendar year from both public and private institutions completing graduate and post graduate studies compared to an age group that corresponds to the typical graduation age in most countries. It does not correspond to the number of graduates in these fields who are available in the labour market in this specific year. The levels and fields of education and training used follow the 1997 version of the International Standard Classification of Education (ISCED97) and the Eurostat Manual of fields of education and training (1999).

The number of students taking tertiary education courses is growing in Europe. Europe's tertiary education institutions produced close on 2.5 million new graduates in 2003 in the EU. 40 % was students of the Baltic Sea Region. Engineering courses were marginally more popular (14.3%) than science (10.6 %). For engineering courses, Finland had the highest proportion of students (26.6%). One of the highest proportions of students studying science was in Germany (14.6%).

The international statistics operate with next two indicators: R&D Efficiency [%] in the year, defined as per-company operating profit in the past 5 years counting backward from the year concerned to per-company internally used R&D expenditure in the past 5 years counting backward from 5 years before the year concerned and growth rate of knowledge-based workers (ISCO88[11]) – increase in the percentage of knowledge-based workers among all employed persons divided by the time period in years (ones of highest in the world has Sweden, Norway, Germany, Denmark).

4. Pre-academic and post-academic pro-innovative education

The building process of a knowledge-based society begins with the basic education, unfortunately the results of the system efforts of this basic education are unknown in the long run because of the migrations. This education level takes place in

[11] The International Standard Classification of Occupations.

the level of a region. The variables which measure the stock of this education level are identifiable by the government offices and public statistics. We are in the worse situation when we consider the variables which measure the academic education's results. We are able to observe the graduates in tertiary education only by geographical location of the high school; not by the place of the origin of the graduate. Monitoring of regional sources should be enriched by the statistics of education's results on the level of the region.

In 1997, OECD member countries launched the Programme for International Student Assessment (PISA), with the aim of monitoring the extent to which students near the end of compulsory schooling have acquired the knowledge and skills essential for full participation in society. This results gives the possibility to benchmarking of the regions. PISA assessments began with comparing students' knowledge and skills in the areas of reading, mathematics, science and problem solving. The assessment of student performance in selected school subjects took place with the understanding, though, that students' success in life depends on a much wider range of competencies. The table 3 presents such benchmarking from OECD data.

Table 3. International comparison of national mean scores and maximal scores in the worst and minimal scores the top 5 percent of population in PISA 2003

Country	5th Percentile		Mean		95th Percentile	
	Score	SE	Score	SE	Score	SE
	Domain: Mathematics					
Latvia	339.23	5.90	483.37	3.69	626.28	4.97
Poland	343.40	5.78	490.24	2.50	639.93	3.50
Norway	343.46	3.96	495.19	2.38	644.74	3.92
OECD Average	331.72	1.30	500.00	0.63	660.20	0.95
Germany	324.04	6.08	502.99	3.32	661.68	3.64
Sweden	352.69	5.29	509.05	2.56	661.93	4.80
Denmark	360.74	4.39	514.29	2.74	661.99	4.73
Finland	406.43	3.83	544.29	1.87	680.17	3.13
	Domain: Problem solving					
Latvia	326.15	6.97	482.51	3.90	628.36	4.89
Poland	337.95	5.55	486.61	2.78	631.67	4.49
Norway	322.24	5.54	489.80	2.60	645.48	4.38
OECD Average	328,30	1,65	499,99	0.64	655.55	0.80
Germany	359.77	6.39	508.57	2.44	647.16	3.57
Sweden	350.64	5.91	513.43	3.24	658.43	3.19
Denmark	368.87	5.02	516.77	2.54	654.89	3.71
Finland	408.56	4.67	547.61	1.86	676.50	3.58
	Domain: science					
Latvia	326.15	6.97	482.51	3.90	628.36	4.89
Poland	337.95	5.55	486.61	2.78	631.67	4.49
Norway	322.24	5.54	489.80	2.60	645.48	4.38
OECD Average	328.30	1.65	499.99	0.64	655.55	0.80
Germany	359.77	6.39	508.57	2.44	647.16	3.57
Sweden	350.64	5.91	513.43	3.24	658.43	3.19
Denmark	368.87	5.02	516.77	2.54	654.89	3.71
Finland	408.56	4.67	547.61	1.86	676.50	3.58

Source: www.pisacountry.aser.edu.au.

There is a significant difference between the post-communist countries and the Nordic countries and the rating is comparable with the EIS2005 rating. The results of this data will be available for the innovation creation in some years.

The participation in life-long learning per 100 population aged 25-64 is comes from the European Union Labour Force Survey – we can observe the job-to-job mobility and the employment data. This data come from a quarterly large sample survey covering the population in private households. This indicator is very closed correlated to the innovations level; for EU countries is shaped on the level of 9.9 % in 2004. The highest values of this indicator in the Baltic Region has Sweden (35.8 %) and the worst – Poland 5.5 %.

The regional experiences, which comes from the process of developing of MORIS system is managed by West Pomeranian Regional Development Agency, show, that the pre and post-academic education have an important influence on the development of the knowledge-based society. MORIS system will gather and present both quantitative and qualitative dimension of education.

Quantitative data are most desired by authorities as they are conducting the process of creating policy and making decisions on spending public funds. On the basis of several criteria, 20 indicators will be selected for analysis. Some of the indicators will be complementary with EuroStat and TrendChart on Innovation to ensure benchmarking possibilities in the future. Qualitative data are more demanded by entrepreneurs, scientists and BSOs. They will be collected and presented in online databases. The West Pomeranian Regional Development agency is aware of the fact that collecting information and conducting research is an expensive process. In this connection, we are planning to use software solutions to lower the cost of managing the system.

Conclusion

The analysis of some indicators, which measure the innovation process, show the disparities between the Nordic and the post-communist countries in the Baltic Sea region. As Pavitt (2001) reminds us ”Scandinavian countries and Switzerland are able to mobilize considerable resources for high quality basic research without the massive defense and health expenditures of the world’s only superpower”: hence, he suggests, ”also the larger European countries and the European Union itself, have more to learn from them than from the USA”.

The initial investigation into innovation in the region of West Pomerania conducted as part of the RIS project revealed an alarming picture. With an average wage of 87 % of the average in Poland, many of the area’s enterprises had become complacent and competed only in terms of price. This had contributed to the end result of a stagnating investment rate in R&D of only 0.27% of GDP compared to a national average of 0.65% and an EU average of 2.0%.

Actions undertaken by the West Pomerania Regional Development Agency as part of the implementation of the Regional Innovation Strategy focused on creating favourable conditions for the development of a technological and innovation market, developing systems to support innovation activities in the region and especially increasing awareness of innovation among small and medium-sized enterprises (SMEs). The important part of the this actions is the monitoring system of the innovative resources and processes in the region.

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