Thematic Network ERIK – European Regions Knowledge based Innovation Network

Thematic Working Group Industry-Science Relations

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GOOD PRACTICE INDICATORS (Final Paper)

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1. INTRODUCTION

The main purpose of the final paper is to provide public authorities with useful tools capable of describing, assessing and comparing regional funded programmes and projects targeted to enhance Industry-Science Relations.

The **target group of this final paper** is represented by public authorities in charge of Policy planning and implementation for the support of innovation at regional level with particular focus on Industry-Science Relations related issues.

The main analysis is thus focused on Programmes and Projects that the region considers to be a good practice in the field of Industry-Science Relations with special attention paid towards good practices developed under the Innovative Actions Programmes that will be included in the ERIK database.

Good practices will be self-evaluated by each region via the on-line database, i.e. each region will both self-select and candidate the regional practice and measure different related key aspects by means of a number of quantitative and qualitative indicators.

More specifically, the final paper includes a first section on **regional Industry-Science Relations performances** that is focused on the main areas of intervention for ISRs and that could be further applied at a later stage for a benchmarking analysis among the interested regions. In this view, an "intelligent benchmarking" approach could be developed at a later stage, starting from the results of quantitative data on regional ISR performances by focusing on a common understanding of the main aspects related to ISR that should be further benchmarked, explored and explained.

The second section provides the **structure for the analysis of regional good practices related to Science-Industry Relations** that each region will decide to candidate and make available through the ERIK database. Here, four thematic areas of intervention for ISR have been explored, more specifically:

- **Collaborative research between Public Science and Industry**
- **Academic spin off creation**
- **Interaction between industry and science in the field of human capital**
- **Technology Transfer from Public Science Institutions to Industry**

The methodological approach for the identification of good practice indicators regarding Science-Industry Relations has been developed mostly by taking into consideration the approach applied to a national benchmarking exercise focused on ISR commissioned by DG Enterprise and the Austrian Federal Ministry of Economy and Labour entitled: "Benchmarking Industry-Science Relations: the Role of Framework Conditions".

More particularly, the concept of ***Framework Conditions*** was proposed as a key element to be taken into consideration while identifying suitable indicators and describing regional practices in the field of ISR.

The analysis of policy-related framework conditions is based on the assumption that these factors are able to influence ISR as features of the regional innovation system.

According to the conceptual model developed under this project, Framework Conditions for ISR are represented by those factors affecting the behavior of the actors involved in knowledge and technology exchange activities.

More in detail**, policy-related framework conditions can affect the performance of a specific innovation system by establishing incentives or barriers to the development of ISR** whose potential is determined by the structural characteristics of the knowledge production structures (such as size, industry structure, R&D orientation, sector specialisation, market characteristics, and cultural and social attitudes). These may explain why ISR performances could be high despite unfavourable structural features of an innovation system, or why they might be lower than one would expect due to the structural characteristics of the knowledge production system.[1]

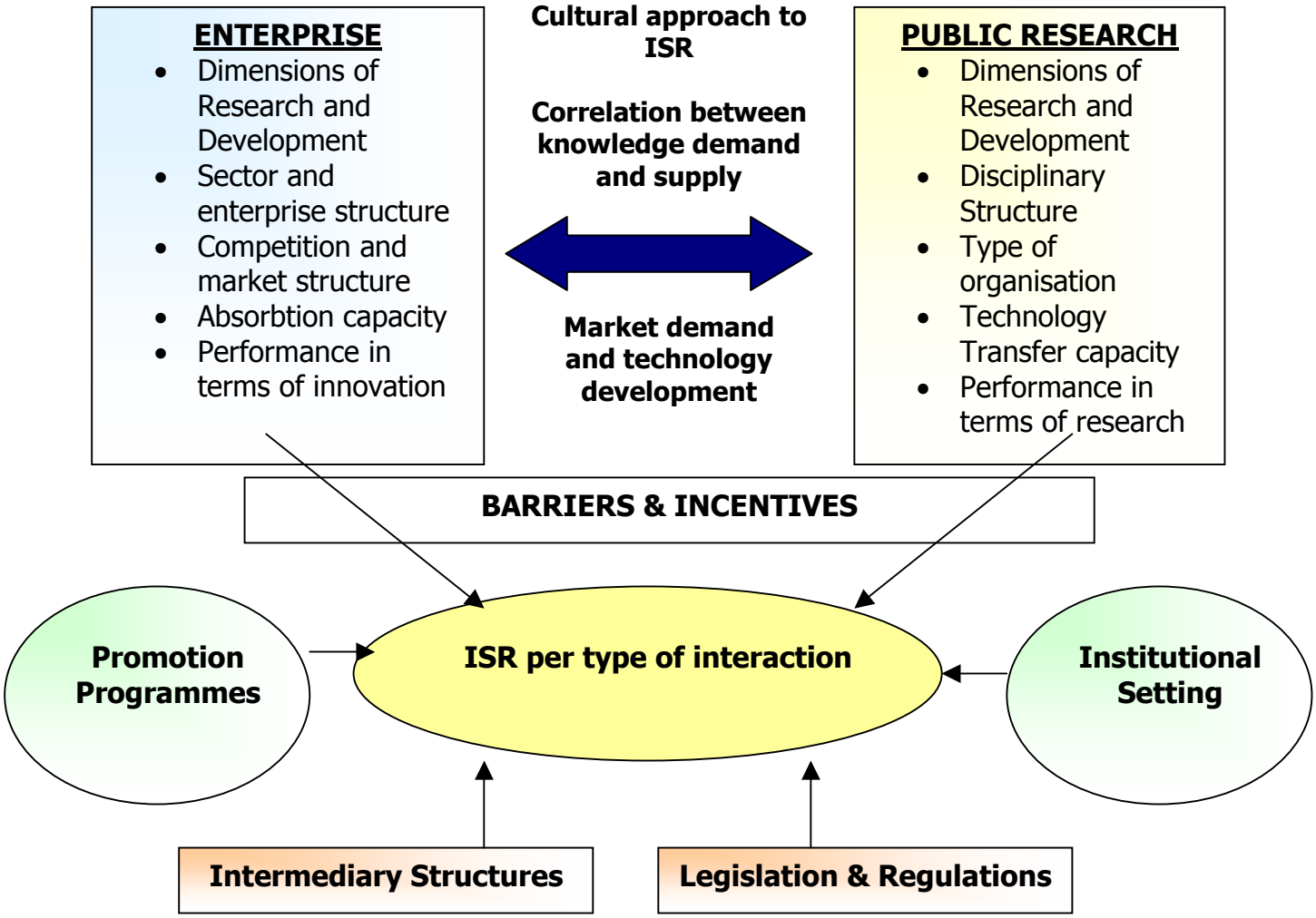
Policy-related framework conditions for ISR are represented by the following elements:

- Public promotion programmes and initiatives
- Institutional setting in public science
- Publicly established or supported infrastructure of intermediaries in the field of ISR
- Legislation and regulation supporting ISR

The definition of thematic indicators has been focussed on the analysis of policy-related framework conditions. These conditions regard those aspects that are strongly dependent on public policies and decisions, hence of major interest for the ERIK network which is expected to collect and transfer good practices related to public initiatives and schemes.

[1] European Commission (Enterprise DG), Federal Ministry of Economy and Labour "*Benchmarking Industry-Science Relations: The Role of Framework Conditions – Final Report"* – Austria. Vienna, June 2001

CONCEPTUAL MODEL TO ANALYSE AND UNDERSTAND ISR[2]



2. FOCUS ON REGIONAL ISR PERFORMANCES

This section is aimed at the definition of the interaction level between Industry and Science at regional level. More specifically, different key areas of analysis have hereby been taken into consideration, according to the methodology proposed in the ISR Benchmarking Study on the Role of Framework Conditions.

The most relevant areas identified are the following:

- **R&D collaboration between Science and Industry**
- **Start-ups from Public Science**
- **IPRs in Public Science Institutions**
- **Mobility of researchers**
- **Interaction between Science and Industry in the field of human capital (training and education)**

[2] European Commission (Enterprise DG), Federal Ministry of Economy and Labour "*Benchmarking Industry-Science Relations: The Role of Framework Conditions – Final Report*" – Austria. Vienna, June 2001

The position of each region participating to the exercise will be assessed by correlating a set of indicators developed for each specific key area and presented below, so as to obtain an overall picture of regional ISR performances.

The result of this section will not be made available through the web site database but it will be used as a basis for discussion among the regions participating to the TWG and for a benchmarking Industry-Science Relations analysis that could be developed at a later stage.

R&D COLLABORATION BETWEEN SCIENCE AND INDUSTRY

- Number of regional researchers[3] involved in joint and/or contract research activities at regional level
- Total amount of contract and joint research carried out at regional level compared to the total amount of regional public R&D
- Total amount of contract and joint research carried out at regional level compared to the total amount of regional R&D activities carried out by the private sector
- Total amount of regional contract and joint research financed through regional/national/European schemes compared to the total amount of regional R&D carried out by Public Science Institutions
- Total amount of regional contract and joint research financed through regional/national/European schemes compared to the total amount of regional R&D carried out by the private sector
- Number of researchers employed for joint research activities at regional level through regional/national/European schemes compared to the total amount of regional researchers

START-UPs FROM PUBLIC SCIENCE

- Number of technology-based start-ups set up by Public Science Institutions in the last three years in the region
- Number of technology-based start-ups set up by Public Science Institutions in the last three years in relation to the total number of companies at regional level
- Number of technology-based start-ups set up by Public Science Institutions in the last three years compared to the total number of researchers at regional level

IPRs IN PUBLIC SCIENCE INSTITUTIONS

- Number of patent applications presented by regional Public Science Institutions (HEIs and Public Research Centres) at the EPO (European Patent Office)
- Total amount of revenues deriving from regional Public Science licensing

[3] If not differently specified, the concept of **Regional Researcher** is to be intended throughout the document as a **Researcher** working in **technological and scientific related fields** at regional level with no regard to his nature (public or private).

- Number of patent applications presented by regional Public Science Institutions (HEIs and Public Research Centres) at the EPO (European Patent Office) compared to the total number of regional researchers
- Number of patent applications presented by regional Public Science Institutions (HEIs and Public Research Centres) at the EPO (European Patent Office) compared to the total number of applications presented at regional level
- Total amount of revenues deriving from regional Public Science licensing compared to the total amount of Public Science Institutions revenues

MOBILITY OF RESEARCHERS

- Number of researchers involved in mobility schemes at regional level
- Number of private researchers compared to the total number of researchers involved in mobility schemes at regional level
- Number of researchers involved in mobility schemes at regional level financed through regional/national/European Programmes/Projects compared to the total number of regional researchers

INTERACTION BETWEEN SCIENCE AND INDUSTRY IN THE FIELD OF HUMAN CAPITAL (TRAINING AND EDUCATION)

- Number of students/graduates involved in training activities (PhD programmes, placements, master thesis, etc.) at regional level
- Total amount of HEIs revenues deriving from vocational training activities at regional level
- Number of students/graduates involved in training activities (PhD programmes, placements, master thesis, etc.) inside companies compared to the total number of regional HEIs students
- Total amount of HEIs revenues deriving from vocational training activities in relation to the total amount of regional HEIs revenues

3. ANALYSIS OF REGIONAL GOOD PRACTICES ON INDUSTRY-SCIENCE RELATIONS

This section will describe the essential structure for the analysis of regional good practices related to Science-Industry Relations that each region will decide to candidate and make available through the ERIK database. Regional good practices will consist in either a Regional Programme or a Project on Industry-Science Relations carried out within the Innovative Actions scheme or under other mainstream programmes implemented at regional level.

The good practice indicators identified in this section are related to a series of relevant areas characterised by a strong collaboration between Science and Industry and in which most interaction between the two spheres takes place. As to capture regional good practices in these different fields, four macro areas have been identified and a set of quantitative and qualitative indicators have been developed for each of the four intervention areas for ISRs.

Qualitative indicators have been developed by customising to the regional dimension the methodology already implemented through the European benchmarking project on framework conditions for ISRs. More in detail, qualitative indicators refer to features of regional policies and public promotion programmes that contribute to shape framework conditions affecting the level of interaction between Industry and Science in the different key areas, thus inducing an increase of the regional innovation capacity through knowledge transfer processes among the main actors operating in the knowledge market. Metrics have been developed for each qualitative indicator in order to employ comparable regional data.

Each region will be requested to choose one or more among the four following areas that are mostly related to the good practice the region intends to candidate and that will be included in ERIK database:

- **Collaborative research between Public Science and Industry**
- **Start-ups from Public Science**
- **Interaction between industry and science in the field of human capital (Mobility of Researchers and co-operation in training and education)**
- **Technology Transfer from Public Science Institutions to Industry**

Each region will provide quantitative and qualitative indicators related to the ISR key area relevant to the specific Programme/Project according to the indications specified in the boxes below.

1. COLLABORATIVE RESEARCH BETWEEN SCIENCE AND INDUSTRY

Joint research activities certainly contribute to the direct transfer of both tacit and coded knowledge from Science to Industry. More specifically, joint research implies a critical amount of face-to-face contacts and the transfer of the implicit part of knowledge may prove to be essential for some research and technology development projects.

Qualitative indicators:

1) Programme/Project thematic focus:

Metric:

0 = research fields are solely set out by the Authority responsible for the Programme/Project implementation according to a top-down approach.

5 = research fields are set out by the Authority responsible for the Programme/Project implementation with a limited involvement of the industrial and public science systems.

10 = the specific field of research is set out through a bottom-up approach via joint initiatives by enterprises and public science institutions involving a thorough analysis both of the technological and the market potential related to the research project.

2) Long-term co-operation perspective:

Metric:

0 = the Programme/Project supports collaborative research between enterprises and public science institutions with no regard to the creation of common infrastructures (either physical or immaterial) for collaborative research

5 = the creation of physical or immaterial infrastructures represents one of the different components of the Programme/Project but does not represent an eligibility criteria

10 = the Programme/Project supports the creation of physical and/or immaterial infrastructures for the implementation of collaborative research. The creation of a new legal entity (i.e. consortia) gathering the different organisations participating to the research project is one of the eligibility prerequisites

3) Selection process:

Metric*:*

0 = the selection process and the consequent funding is not based on a competitive process among different proposals

5 = a competition-based approach is used for the allocation of funds but quality is not assessed through a peer-review from representatives of industry and science

10 **=** a competition-based approach relying on peer-review from industry and science is used in the selection of the research projects to be financed

4) Intellectual Property Rights:

Metric*:*

O = no supportive infrastructure/services have been created/fostered through the Programme/Project to reduce transaction costs and information asymmetries in using IPRs (patent and licensing offices)

5 = the Programme/Project has not paid sufficient attention to IPR aspects in the allocation of resources

10 = supportive infrastructure/services have been created/fostered through the Programme/Project to reduce transaction costs and information asymmetries in using IPRs (patent and licensing offices)

Quantitative indicators:

- Number of researchers involved in collaborative research through the Programme/Project
- Number of new researchers employed through the Programme/Project to carry out collaborative research
- Number of enterprises involved in collaborative research activities financed through the Programme/Project in relation to the total number of enterprises operating in medium and hi-tech fields at regional level.
- Number of SMEs taking part in joint research activities through the Programme/Project in relation to the total number of SMEs at regional level

2. START-UPs FROM PUBLIC SCIENCE

The creation of academic spin offs is considered to testify the Public Research Sector degree of entrepreneurship, of the ability to develop knowledge that is commercially exploitable and marketable and of the existing technology transfer capabilities.

Qualitative Indicators:

1 Regional physical and immaterial infrastructure supporting spin off creation

Metric:

0 = Supportive infrastructure has not been created through the Programme/Project

5 = Supportive infrastructure has been created through the Programme/Project but has proved to be irrelevant for spin off creation and development (no spin off created and maintained)

10 = Supportive infrastructure has been created through the Programme/Project and has proved to be effective for spin off creation and development

2 Adoption of entrepreneurial climate in public research institutions

Metric*:*

0 = the Programme/Project does not intervene on aspects related to entrepreneurial climate enhancement in public research institutions

5 = the Programme/Project intervenes on aspects related to entrepreneurial climate change in public institutions solely via financial supportive measures

10 = the Programme/Project considers the entrepreneurial climate change in public research institutions as a key factor in spin off promotion. Apart from financial support (pre-seed and seed capital), consulting services and awareness raising initiatives inside public research institutions are promoted.

3 Intellectual Property Rights

Metric

O = no supportive infrastructure/services have been created/fostered through the Programme/Project to reduce transaction costs and information asymmetries in using IPRs (patent and licensing offices)

5 = the Programme/Project has not paid sufficient attention to IPR aspects in the allocation of resources

10 = supportive infrastructure/services have been created/fostered through the Programme/Project to reduce transaction costs and information asymmetries in using IPRs (patent and licensing offices)

4 Leverage effect of public capital

O = 0% leverage effect: no private venture capital attracted in the three years following foundation of the academic spin off financed through the Programme/Project

5 = 100% leverage effect: 1 Euro of private venture capital attracted for each public Euro spent through the Programme/Project in the three years following spin off foundation

10 = 1.000% leverage effect: 10 Euros of private venture capital attracted for each public Euro spent through the Programme/Project in the three years following spin off foundation

Quantitative indicators:

- Number of technology-based academic start ups created in the last three years
- Number of technology-based academic start ups created through the Programme/Project
- Number of technology-based academic start ups created through the Programme/Project in relation to the number of researchers at regional level
- Number of new jobs created through the Programme/Project supporting academic technology based start-ups
- Survival rate: number of academic technology based start-ups maintained for 3 years since foundation in relation to the total number of start-ups created through the Programme/Project

3. INTERACTION BETWEEN INDUSTRY AND SCIENCE IN THE FIELD OF HUMAN CAPITAL (MOBILITY OF RESEARCHERS AND CO-OPERATION IN TRAINING AND EDUCATION)

Mobility of researchers represents an important channel of interaction between Science and Industry as it constitutes an instrument for direct transfer of knowledge from Industry to the Public Research sector. Mobility also becomes an on-the-field practice for the transfer of knowledge and a collaboration opportunity with companies with an established network of personal relations that researchers contribute to bring into Public Science Institutions.

The training activities carried out by research Institutions towards the business sector and, viceversa, by representatives from the business sector targeted to Universities also favours the transfer process of tacit and coded knowledge from one sphere to the other.

Qualitative indicators:

1 Matching companies training needs with competences available at the HEIs level

0 = neither business specific needs nor proper incentives for students/graduates are taken into account by the Programme/Project supporting interaction between industry and science in the field of human capital

5 = either private sector educational needs or incentives for students/graduates to embark on exchange programmes with companies are key factors of the Programme/Project

10 = the Programme/Project supports the interaction between industry and science in the field of human capital both by setting out proper incentives for students/graduates and by targeting the business educational specific needs.

Quantitative indicators:

- Number of public researchers involved in mobility schemes introduced through the Programme/Project compared to the total number of researchers at regional level
- Number of private researchers involved in mobility schemes introduced through the Programme/Project in relation to the total number of researchers at regional level
- Number of HEIs students/graduates involved in training activities inside companies financed through the Programme/Project (PhD programmes, placements, master thesis, etc.)
- HEIs revenues coming from vocational training activities carried out within the Programme/Project compared to the total amount of HEIs revenues
- Number of students/graduates participating to the training activities inside companies financed through the Programme/Project who found an employment inside companies at the completion of the Programme/Project compared to the total number of students participating to the financed training initiatives
- Number of SMEs financed through the Programme/Project supporting interaction in the field of human capital between public science institutions and SMEs in relation to the total number of SMEs at regional level

4. TECHNOLOGY TRANSFER FROM PUBLIC SCIENCE INSTITUTIONS TO INDUSTRY

Technology Transfer (TT) capabilities of Public Science Institutions are significantly affected by the organisational structure, the institutional mission and strategy, and the legislative framework in which Public Science Institutions operate. These factors may constitute strong incentives or obstacles to ISRs.

Hence, institutional settings in Public Science have a major role in shaping the potential for ISRs, although specific policies and programmes can intervene by supporting TT activities, thus diminishing the hindrances to interaction resulting from the existing framework conditions.

Regional Programmes/Projects focussed on TT enhancement may adopt and support different TT organisational models (organisational units or specialised departments within Public Research Organisations; subsidiary organisations connected to a specific Public Research Organisation or a specific department; public/private independent intermediaries serving more than one publicly funded Research Organisation[4]), may rely on a different approach towards TT related aspects at regional level and may conduct to a different service portfolio.

Qualitative indicators:

1 ***Impact of infrastructure in the Promotion of Technology Transfer activities in public science institutions***

Metric

0 = the Programme/Project do not support TT activities in public science through specific TT services provided by an internal/external supportive infrastructure and the responsibility for TT activities are not located at the level of researcher groups and individuals.

- [4] European Commission, (DG Enterprise), *"Technology Transfer Institutions in Europe: an overview"* - Best Project "ITTE" 1.11/2002, April 2004

5 = the Programme/Project supports TT activities in public science through specific TT services provided by an internal/external supportive infrastructure only to a certain degree

10 = TT activities are supported through the Programme/Project via specific supportive infrastructure inside/outside the Research Institutions providing TT services through a decentralised model of TT (i.e. the responsibility for TT activities are located at the level of researcher groups and individuals)

2 Nature of TT activities

Metric:

0 = the Programme/Project only supports TT activities related to awareness raising and dissemination initiatives

5 = the Programme/Project supports specific TT actions merely limited to the Programme/Project itself. No long-term or systemic approach to TT related issues is taken into consideration

10 = the Programme/Project supports TT activities with a strong emphasis towards the adoption of a systemic and long-term approach to TT related issues and service supply

3 TT services

Metric:

0 = the Programme/Project do not support neither physical/virtual TT Organisations nor subsides TT service acquisition (liaison services for contract research, market analysis, patenting, licensing, spin-off support and fund raising, etc.)

5= the Programme/Project finances TT service acquisition (liaison services for contract research, market analysis, patenting, licensing, spin-off support and fund raising, etc.)

10 = the Programme/Project supports and finances physical/virtual TT Organisations and/or make services available through a structured and organised system acting as a single TT access point

Quantitative indicators:

- Amount of financial resources allocated through the Programme/Project for TT activities
- Number of regional companies involved in the TT activities foreseen by the Programme/Project
- Number of IPR agreements formalised and signed by Public Science Institutions and enterprises through the Programme/Project
- Number of patent applications and licensing agreements established as a result of the Programme/Project support

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